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THE TEACHING OF SURGERY[1]

PRESIDENT'S ADDRESS

BY DUDLEY P. ALLEN, M.D.

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A GENERATION in the history of any profession is seemingly a short period. The importance of a period may not, however, be measured by years, but by events. Measured by this standard, the generation now passing has lived in one of the great epochs, if not the greatest in the history of surgery.

One of my earliest memories in the line of surgery, is of an old man, going about on crutches, with an amputation in the middle of the thigh. I was told that the operation had been performed by my grandfather, without the use of an anesthetic.

The first amputation I ever saw was made in the anatomical amphitheater of a medical school, in order that it might be witnessed by a larger audience than could be accomodated in the hospital. The patient occupied a table which but a few moments before had been vacated by a cadavar.

To allow one's memory free rein would trespass upon your time; and still, it is alluring to recall certain past events. To have witnessed during three years the development of the operation of litholapaxy, in the hands of Bigelow, was most interesting. To have seen his spectacular demonstration of the reduction of dislocations of the hip, was a sight never to be forgotten.

No one who ever took the noted course in operative surgery under Langenbeck, and followed his clinical teaching, will ever forget his painstaking instruction. I heard him remark that no suprapubic operation for the removal of a vesical calculus had, so far as he knew, ever proved successful. All had terminated in sepsis. Should he ever attempt the operation again, he said he would afterward place the patient in a permanent bath, in order to decrease the dangers of sepsis by diluting the urine.

In the height of his powers, no teacher was more brilliant or more attractive than Volkmann. He early discarded the spray. As he flushed wounds every few moments with a solution of carbolic acid, poured from a height of three or four feet from the spout of a watering pot, similar to that used in watering flowers, he and his assistants stood in a pool of water and blood. It was, however, his success in treating compound fractures of the leg by this method which revolutionized surgery in Germany.

Billroth's first successful resection of the pylorus astonished the world. To have stood next to him in one of the earliest of these operations is a memorable event. It is no wonder that a teacher at once so brilliant, and so genial, should have endeared himself to all his pupils.

The surgical clinics of Paris, the operators in full dress, with the wide expanse of shirt front, protected perhaps only by a napkin, tucked in above the collar, comes back to one

[1] Read before the American Surgical Association, May 7, 1907.

almost as a dream. The charcoal brazier, lighted and having in it the heated irons, still in not infrequent use, carries the mind back at one leap well-nigh to the days of Ambrose Paré.

The great surgeons of the generations past have been our teachers. Their masterly contributions to surgery are our inheritance. We cherish their memory and their instruction. It seems impossible that during a similar period so much advance in surgery can again take place. Certainly it cannot, unless some new light breaks upon us, a light which may perhaps enable us to combat certain diseases, as for instance, cancer, without the knife. They taught us by clinics and by lectures. Students journeyed far to listen to their instruction. In his introductory lecture in anatomy, Oliver Wendell Holmes once asked the questions, "Why do men attend universities to listen to lectures which they might read with so much less expenditure of time and money? Why have they always done so?" "Because," he said, "no printed page ever has given or ever can give to teaching the force of the words spoken by a great instructor."

The especial theme which I wish to bring before you to-day is, however, not what has been inherited from the generation fast passing away, but rather how that knowledge may best be imparted to the present generation of students; how to teach them so that they may be not only learned in the knowledge of what has gone before, but that they may be capable searchers after new knowledge. The question is not only, What shall be taught, but how can instruction best be imparted?

In deciding how surgery shall be taught, and how much it is wise to give to the average student, it is obvious that the question cannot be answered arbitrarily. The character of the instruction must unquestionably vary, not only with the facilities at the command of various schools, but also with the abilities, training, and characteristics, of the individual teacher. As has been well said, "A man may teach most successfully after a method agreeable to himself, but poorly after the prescribed method of another."

It is unnecessary to consider the question of the education of men who are to practice in the thinly populated sections of our country. It is desirable that these sections should have physicians of good general education, but scattered communities cannot, unless for special reasons, attract men of the highest training. The purpose of this paper is to discuss methods of education in schools of the first rank alone.

For men who do not propose to become practitioners, but who intend to do laboratory work exclusively, a limited general training may be sufficient. It is quite possible, however, that a considerable knowledge of both medicine and surgery would result in directing the investigations of the laboratory workers along lines which would be increasingly beneficial to the clinician.

Every surgeon, in addition to his special field, should be thoroughly trained in medicine. The reasons for this are obvious. No surgeon can be a good diagnostician and a wise counselor, who is not thoroughly acquainted with the various diseases affecting the abdomen and thorax. The recognition of typhoid perforations; the relative merits of medical and surgical means of relieving diseased conditions of the digestive tract; the significance of cardiac lesions, as determining the advisability of operations; the location of abscesses, whether in the lower part of the thorax, in the liver, or in the gall-bladder; the diagnosis of empyema and pulmonary abscesses, and how best to evacuate them — all of these demand of the surgeon first-class ability as a diagnostician. In the surgery of the female pelvis, the diagnosis of early pregnancy is often of the highest importance. The lack of skill in this direction has led many a surgeon to cut down even upon a normal uterus at term.

A surgeon of the first rank should be thoroughly intelligent in diseases of the ear, on account of their relationship to meningitis, sinus thrombosis, and brain abscess. Ignorance of the laryngoscope may lead to the extirpation of the lyrynx for malignant disease, when such disease is absent. In a word, though a surgeon should limit his personal service strictly to those fields in which he is a master, he should be sufficiently intelligent, in every direction, to recognize when he needs advice or aid from men of especial knowledge in other fields. He should, most of all, know in what cases medicine can give relief without operative interference. He should be able to decide wisely, not whether

an operation can be done, but whether it offers a better promise of benefit than any other method.

It is not long since graduates of medical schools entered upon the practice of their profession with little practical knowledge, and less personal experience, in surgery. Many of them undertook whatever surgery presented itself. In cases of emergency this was often necessary. The only limit to the activities of some so-called surgeons is the possibility of an operation, and the consent of the patient. No one but a surgeon who has carefully watched over the first essays at operations of his own assistants, has any conception of the possibilities of error in the operations of a beginner in surgery. The final success of untrained men in surgery has been at the cost of many lives, and much suffering and misfortune, on the part of many patients. Certain conditions existing at the present time do not tend to decrease the difficulty. Everywhere in towns of but a few thousand inhabitants hospitals are springing into existence. The general public is trained to understand that the possibilities of surgery are great, and that a hospital offers the greatest safety to a patient. The public has not learned that the safety of a hospital depends upon its equipment, and administration; and the results of operation, upon the ability, training, and character, of the surgeon. The glamor of operations to the untrained and unskilled, emboldened by a partial immunity from sepsis, gained by a very limited knowledge of surgical technique, has done much to counterbalance what should have been the benefits and security of modern surgery. There is little hope of an early escape from this condition of affairs. The avenue of improvement would seem to be in a full appreciation of present conditions and an advance in the methods of training surgeons. The public will gradually, but inevitably, come to appreciate the vast difference between men called surgeons, and institutions called hospitals.

How are men to be trained so as to render the best service to their fellows, and at the same time most efficiently advance knowledge? In studying this question it has been most interesting to compare the varying opinions held by various teachers and schools. A partial summary of some of the conflicting opinions may be of interest:

1. A complete course of systematic lectures covering the entire field of surgery is important.

2. Systematic instruction may best be obtained by recitations from a text-book, supplemented by the quiz-master or by regular lectures covering advances in surgery more recent than the text-book.

3. The systematic and comprehensive presentation of the subject of surgery is unnecessary. The thorough mastery of certain of the most important subjects will so train the student's mind that he will himself make good many omissions.

In another direction opinions are equally at variance:

1. The large clinic given by a teacher of vast experience, able by wise master-strokes to present a picture in proper perspective, giving to an entire class what his time will not permit him to repeat to a number of sections, cannot wisely be supplanted by the section work.

2. Large clinics are almost valueless. The majority of students see little and profit less than when taught in small sections.

3. The student profits chiefly if permitted to serve as an assistant in operations.

There is a wide divergence of opinion as to the teaching of operative surgery:

1. Operative surgery, taught on the cadavar, is of great value in giving an accurate and practical knowledge of regional surgery, the formation of flaps, resections, intracranial operations, etc.

2. Operations upon the cadavar are not only valueless, but undesirable — since they teach carelessness — as compared with operations upon the live tissues of animals. Operations upon animals, on the other hand, conducted with strict asepsis, are of the greatest benefit in inculcating the principles of surgical technique; and the method may be made equally valuable in teaching diagnosis and treatment.

Opinions are also divided as to the elective system in the study of medicine. Some would dispense with all didactic teaching and large clinics, during the last college year, instructing students solely in small sections, or utilizing them as assistants in hospital wards and at operations. Without worrying you further with details, it is evident that the methods followed by various schools differ greatly. It is also evident that we are departing widely from the precedents set by our predecessors, and by the faculties of foreign universities. There is one point, however, upon which it would seem there can be but little difference of opinion.

When one considers the vast increase there has been in medical knowledge, the far greater proportion of time now given to laboratory instruction, as compared with former years, and the great development of instruction in what are called the special lines of practice, it is evident that it must be impossible, in four years, to give to any student what might be termed training as a specialist in any one branch.

The great misfortune of the specialist of the present day is his inadequate knowledge of other departments than his own. To allow specialization during a four-year course of study is to breed narrow men. Unquestionably a general hospital training, after a full course of study, would be of great value, even to one intending to become a specialist. He would then have the broad foundation upon which to build, and would more properly deserve the respect due to the man of especial knowledge. On the other hand, since ignorance of the lines of especial practice must be a great misfortune to every man, and most especially to the general practitioner of medicine and surgery, it must be of the greatest value to give to every student well-devised and well-proportioned instruction in what are called the specialties.

Every Fellow of this Association must have been a frequent witness to the misfortunes which have resulted from the lack, not only of general, but also of special training.

Should it be granted that four years are not more than sufficient to give to students thorough training in the general lines of medicine, obstetrics, and surgery, and an intelligent appreciation of special lines of practice, and should it also be granted that the student who intends to become a surgeon can attain the necessary knowledge only through hospital residence, and post-graduate study in various hospitals, both at home and abroad, how may the time assigned to the teaching of surgery be best employed?

To be dogmatic in the discussion of this subject would evidently be inappropriate. Unquestionably the end may be obtained by a variety of methods. No two institutions, no two men, can follow exactly the same method with equal success. Certain things, however, seem fundamental. All students should have an intelligent comprehension of what surgical disease is, and the results it produces. This can only be taught by the study of surgical pathology. Brilliantly as this is taught by some schools in the United States, it is my observation that both in this country, and abroad, there is no subject in which it is so difficult to secure satisfactory instruction.

The student should be thoroughly drilled in diagnosis; and, though much valuable instruction may be given by the experienced teacher before considerable numbers of students, better than can possibly be given by teachers of less breadth of knowledge to small numbers, there can be no question that the intimate instruction given to small classes, bringing each student in close contact with the patient, is of vast importance. The departure made by some schools in this direction is a great advance. Both methods are, however, desirable. The student should also be taught to write accurate histories of his cases. An accurate history cannot be written without an accurate and painstaking examination.

It would seem wise, also, that every student should have a fairly comprehensive knowledge of surgery. This will be of benefit to the future physician, enabling him to know when he may turn to the surgeon for timely aid. It is essential to the surgeon. It is of course impossible with the time given to the teaching of surgery that it should be too minute in special directions. Exhaustive instruction in certain lines might mean the total neglect of others. How can this comprehensive knowledge be obtained?

Teachers who command so abundant clinical and pathologic material as to enable them to present large groups of clinical cases at the same time from a clinical, a therapeutic, and a pathologic standpoint, can afford students unusual opportunities for the acquirement of knowledge. Few have such facilities. How may others with smaller material give systematic instruction? Four methods, variously combined, are in common use in this country: (1) Recitations from a text-book, supplemented by the remarks of the teacher. (2) Regular lectures, followed by the quiz. (3) Clinical instruction, with remarks upon the various

cases. (After a sufficient number of cases along a given line have been demonstrated, the teacher summarizes them and presents the subject in its general bearings.) (4) Teaching, chiefly in small sections, with the instruction and quizzing incident to it, a limited amount of systematic teaching, so-called, being given.

It would be presumptuous to say what is the best method. It is certain, however, that the repetition of his knowledge by the student in written reports, in the recitation, the quiz, or the section work, has two great advantages, namely, (1) the student can only make accurate statements if he has accurate knowledge; (2) the failure of a considerable number of students to demonstrate their possession of accurate knowledge, must prove to the teacher that he has signally failed in his instruction.

A remark once made to a teacher whose examinations were especially severe, and who usually "plucked" half of his class, was most appropriate. His associate said, "I should be ashamed if I should teach a class of students in such a manner that so large a proportion would fail to pass my examinations."

The student whether by recitation, by discussion, or by written report, should continuously be required to demonstrate the accuracy of his knowledge. It would doubtless be of the greatest value to him to be stimulated to investigate and report upon certain assigned themes requiring both reading and special study. He would thus necessarily be led to think for himself. The tendency in America is to overburden the student, with teaching and so to fill up his time that none remains to him in which to do anything along individual lines. As a result, too many students leave college crammed with facts, but lacking in the ability to work independently, and to increase their knowledge by their own initiative at a later period. Thus it would seem that: First, some quizzing at least on the part of the lecturer himself would be beneficial both to the student and the teacher; second, that quizzing in small sections, commonly in connection with clinical cases would be an absolute essential; and third, that the seminar, discussing with the student, before his fellows, work performed by himself would be of the greatest value. By whatever method it is accomplished, it is desirable that the instruction should be so comprehensive that there should remain no important subjects in surgery upon which the student is not at least intelligent. He should also, so to speak, be made, not only a consumer but a producer of knowledge.

The teaching of surgical pathology is most important. As has already been said, this is as a rule most inadequately done. Few schools have the requisite facilities. It is of value to understand this subject from the general viewpoint. It is of greater value still, if to a general knowledge of the gross and microscopic specimens can be added a study of specific cases seen clinically. This is very rarely done. Were it done, more men would be led later in practice to follow their clinical material to the laboratory, and from its study be able to increase the accuracy both of their diagnosis and prognosis in many cases. The closer contact of the clinician with the laboratory worker would also doubtless aid the latter in the formation of opinions valuable to the former. It might also bring about another result much to be desired. Many things, the product of laboratory investigation or experimentation, have been offered to the clinician as of therapeutic value. We have been living in the age, as it were, of the laboratory. The whole profession has welcomed its labors and its discoveries.

The greatest money expenditure in teaching has been for the laboratory. Everyone rejoices in its great development. Everyone acknowledges the value of the laboratory method. At the same time there can be few clinicians who have not had reason for grave disappointment, many times, when they have felt compelled to put aside conclusions reached through long clinical experience, and be guided by those from the laboratory, on the ground that the latter alone were reliable, only to find that they had erred in so doing. There has been, and still is, a vast amount of fetich about laboratory findings and instruments of precision. When, years ago, in Cohnheim's laboratory, I had worked long and without being able to reach a conclusion upon some microscopic specimen, I often turned to one of his subordinates, who usually could explain the specimen at once. Still remaining unsatisfied I have turned to Cohnheim himself. In his

kindly way he would sit down and study long and carefully, and perhaps say at length, "I am uncertain what that specimen is, you had better ask Professor Weigert," a distinguished authority then associated with him. Cohnheim, one of the most inspiring teachers of his age, was great enough to recognize his limitations.

The findings of the laboratory, prized as they are by all of us, are no more accurate than the accuracy of the investigator who makes them. The vast intricacy of the problems under investigation makes of little value the results obtained by any save the thoroughly competent workers. Much that is published at the present time, as research work, has absolutely no value except to advertise the man who writes it. These published conclusions would not be accepted so unquestionably by the clinician, were he so trained in laboratory methods as to be a competent judge of their value. Could the student bring into close association his clinical material and his physiologic and pathologic training, bringing the one to bear upon the other, it would doubtless be greatly to the benefit of both laboratory and patient — the application of laboratory findings to the clinic would be more efficient, and the clinician would doubtless learn more accurate diagnosis through thorough acquaintance with laboratory methods.

The question of how best to teach surgical technique and operative surgery, is now under active discussion. That instruction in this department of surgery should be given early in the teaching of surgery, seems wise. It is desirable that students should early comprehend asepsis and the details of operations. The teaching of these upon dogs seems a distinct advance, since the details of asepsis can be taught as accurately in this way as in any other, and the method has the advantage that errors do not jeopardize the life of a patient. Operations upon live tissues give opportunity for genuine training, comparable to operations upon human beings.

It does not seem equally clear that the teaching of operative surgery upon the cadavar should be abandoned. If cadavars which have not been hardened by preservatives are used, it is possible to teach the student much about the formation of flaps, the resection of joints, the ligation of vessels, certain operations upon the skull, etc. It teaches him also that operation and dissection are two different things. In the days before the advent of anesthesia, dexterity and despatch in operating were essentials to success. To witness the dissecting and dilatory methods rendered possible by anesthesia and asepsis, methods now too commonly in vogue, is a distinct step backward. Even though contused and lacerated tissues may heal under asepsis, it in no manner argues against the desirability of operating with clean-cut incisions, the minimum handling of tissues, and the greatest dispatch compatible with accurate work. Is not the human body still the best object upon which to practice certain operative procedures, and will there not always remain great value in familiarity with the various important surgical regions of the body from the standpoint of applied surgery, in addition to that of anatomy?

Among the later departures in the teaching of surgery is to do away largely or entirely with any systematic or class work during the fourth year of college. I wish to say here emphatically, that I believe this is a bad plan. Instruction for short periods in sections, although of the greatest value, can never take the place of instruction given by the clinician. Section teaching is most laborious and time-robbing. The teacher wearies of repeating the same instruction several times during a semester. He will have lost his enthusiam after several repetitions. The fate of such instruction must be that it will be abandoned to the younger men. Some of these young men will do admirable work, some will do very ordinary work. The teaching of the various sections of a class will be unequal. No one will question the desirability of section teaching. What is questioned is the plan to abandon, during the fourth year, all systematic instruction to the class as a whole. The dogmatic teacher is always popular. There will always remain, however, an important place where the clinician of great experience can give to students a broad view of surgery, unattainable in any other manner. Should medical colleges ever be able to command the entire time of a surgeon, as a teacher in a university clinic, desirable as this would be, it would never render undesirable the added teaching of the broad clinician.

There remains for consideration the question of electives. While every one will perhaps grant their desirability for men who expect to pursue laboratory courses alone, their importance for men who are to practise medicine or surgery is an entirely different question. As has already been said, it is most desirable that every student should be thoroughly grounded in the knowledge which is fundamental to the practice of his profession, and it is also important that he should be equally intelligent in what are called the specialties. If he does not have this knowledge he may fail to secure for his patient the help of which he stands in the greatest need. There is, however, at the present time no greater curse in the profession, and the community, than the specialist, falsely so-called.

It is time enough to put up a signboard pointing the student to special lines of practice, when he has completed his regular course in the medical school. Four yeais are all too short for the acquirement of sufficient knowledge. Our neighbors in Canada will soon require five years. Across the sea, six years have long been requisite. I believe we shall do better to train men systematically for four years. The time is not far distant when five will be required. After a systematic course of training it will be time enough for men seeking to enter special fields of practice, to gain by hospital service and post-graduate study, here and abroad, the more advanced knowledge absolutely necessary to entitle them to offer their services to the profession and the public, as possessed of special knowledge.

No training is more valuable to a young man than to serve under a capable surgeon as an assistant in a hospital. Such assistantship should be sufficiently long to give breadth of observation and an opportunity to do operations. The internship common in most hospitals is inadequate to such training. The residence should be longer and the opportunities more ample. Haste has no place in the training of a surgeon. It would be of great value if, after the ordinary internship, selected men could be retained for a longer period as assistants, supervising the body of interns. It is also very desirable that these men should be actively engaged in working up the pathologic material coming from the surgical clinic. Combined clinical and pathologic knowledge, thus obtained, will train a body of young surgeons which must unquestionably command the respect of the entire profession, and the confidence of the public. Young men thus trained will preserve the best traditions of the past, and contribute to the knowledge of the future. The answer to the question of how to train men to become surgeons, is to train them thoroughly.

There remains for consideration a difficult question. How may a standard of surgical knowledge be established, the attainment of which will gain men general recogniton? Combined action on the part of state examining boards is seemingly unattainable. It is a question whether a national examining board could be created whose findings would be mandatory upon all states.

The American Surgical Association could create itself a National College of Surgeons and hold annual examinations. Only those passing this examination would be eligible to Fellowship. The eligibility to such Fellowship, and the certificate of having passed such an examination, would at once give a man a recognized standing. It would commend him as a thoroughly trained man to any community in the United States where he might wish to live. Doubtless such a certificate would gain recognition abroad. To formulate a wise plan would require mature deliberation. Is it not worthy of our consideration?

Without longer trespassing upon your time, the purpose of this paper may be summarized in a few words: It is to urge for the training of surgeons: First, thorough and broad instruction; second, prolonged hospital residence and post-graduate study; and third, the establishment of some standard of attainment which must be reached by men to gain them general recognition by the profession. If these ends be attained, the community and the general profession will not long remain in doubt as to the men who are deserving of their confidence and support. Such a standard would do much to protect the public from incompetent men, and to place in the hands of capable surgeons those facilities, which they alone are able to utilize to the best development of their profession, and the best interests of humanity.

ACQUIRED DIVERTICULITIS OF THE LARGE INTESTINE[1]

By WILLIAM J. MAYO, M. D.
In Collaboration with LOUIS B. WILSON, M. D., and H. Z. GIFFIN, M.D.
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DURING the past eleven years, a certain group of cases has been observed clinically, but they have not until recently been placed upon a sound pathologic basis. The cases of this description which have come to our notice, are as follows:

In 1896, a well-nourished man of fifty-one years of age, presented himself at our clinic with an internal fecal fistula into the bladder. The history in brief was, that some months previously he had been seized with pain and soreness in the left inguinal region and a tumefaction followed. After a number of weeks of illness, there was a spontaneous evacuation of a large amount of foul pus by way of the bladder. The tumor disappeared but from that time there had been more or less escape of gas and feces into the cystic cavity. A diagnosis was made of probable appendicial abscess with secondary internal fistula. Upon opening the abdomen the appendix was found normal, but in the sigmoid flexure of the colon was a considerable sized sausage-shaped tumor imbedded in a mass of adhesions, and a fistula existed between the sigmoid and the bladder. This was divided, the opening into each viscus sutured, and free drainage introduced. The suturing proved imperfect and a combined urinary and fecal fistula to the surface was the result. The bladder-opening healed in a few weeks, but when the patient was last seen, two years after the operation, the fistula occasionally discharged gas and hard particles of feces.

Second and third cases of the same character have since been under our care. The colon, which has been concerned, is that part which stores waste products for intermittent elimination, and lies distal to the splenic flexure.

In addition to these three cases of internal fistula, several patients have presented themselves with abscess or external fistula, having the same etiology. One, a physician, very fleshy, had been suddenly taken sick with what he described as, "like an appendicitis on the left side." After a number of weeks a large abscess formed. This was evacuated by an abdominal incision. Since that time there has been a small fecal fistula to the surface of the body, which would nearly heal and then be followed by an exacerbation, with the escape of a purulent fluid containing one or more small hardened fecal masses about half the size of a pea. Under the belief that it was in some way connected with the appendix, this organ had been removed by the surgeon in charge, and found to be normal, the seat of the disturbance being located in the sigmoid.

Another case was that of a male who had two years before been operated on for acute appendicitis, and who said that the present trouble was exactly like that of his attack of appendicitis, except that it was located on the left side.

In five instances patients have presented themselves with a well-marked tumor in the left side, which in three cases had appeared suddenly with inflammatory symptoms; obstruction of the large intestine had resulted. In all five, the colon was resected, and in each the gross appearance *in situ*, was that of carcinoma. Examination of the removed specimens, however, showed that no malignant disease was present.

But not all of these cases go on to the production of such serious symptoms. We have had a small numbe of elderly, and usually obese, patients, who have been suddenly attacked with severe pain in the left side. An indefinite tumefaction would appear. After a thorough evacuation of the bowels, the trouble would subside, though the feeling of tenderness and resistance on deep palpation would last for several weeks. In two of these individuals there have been one or more relapses.

All the patients coming under observation

[1] Read before the American Surgical Association, May 8, 1907.

have had certain features in common. They were over forty-five years of age; all but four were males, and, excepting for this illness, were otherwise in robust health, most of them inclining to obesity. The onset of the symptoms was sudden, and presented the characteristics of a localized peritonitis. A tumor rapidly developed, and usually lay to the left of the median line in the middle or lower quadrant of the abdomen.

In all of the cases the disease has originated in the descending colon and sigmoid, between the splenic flexure and the rectum, structures which are derived from the primitive "hind gut."

The cases briefly cited above naturally drop into three clinical groups. First, those in which an intraperitoneal abscess forms, with spontaneous evacuation into a neighboring viscus, or evacuation externally by means of operation. Second, those cases giving rise to acute or chronic obstruction necessitating operation. Third, those in which the symptoms are mild and recovery occurs spontaneously.

SURGICAL TREATMENT

The surgical treatment of diverticulitis of the colon depends upon the condition present. First, localized suppurative cases must be treated by free drainage. If, in conjunction with the infective process, acute obstruction of the bowels develops as in the cases reported, a temporary artificial anus should be made, and if necessary, after the infection has subsided, the involved colon may be resected. Second, if a considerable tumor is present and the symptoms do not show a tendency to disappear, it is better to make a primary resection of the affected part of the bowel, before abscess and fistula supervene to render patients prolonged invalids.

In all of the cases which we have resected, the disease has been limited to from four to eight inches of the gut, and all of those that recovered from the operation, have remained in perfect health. The milder cases which tend to spontaneous recovery do not suggest operative treatment.

Dr. L. B. Wilson will discuss the pathology of these cases and Dr. H. Z. Giffin the clinical course.

Report on the Pathologic Examination of Five Cases of Diverticulitis and Peridiverticulitis of the Sigmoid. By Dr. L. B. Wilson

Case 1. (H1903.) The specimen of sigmoid resected in this case was about 16 cm. long (Fig. 1).[2] The mesentery contained a hemispherical nodular mass, 1 to 4 cm. thick, and 7 cm. in transverse diameter. This mass consisted of two diverticula, swollen glands, and inflammatory exudate. On section, one of the diverticula (Fig. 2) was found to have ulcerated almost through into the peritoneum. Its walls had sloughed and presented ragged, overhanging edges, leading to a provisional diagnosis of carcinoma. Microscopic examination, however, showed no carcinoma.

The other diverticulum (Fig 3) had an inflammatory mass 3 cm. in diameter surrounding its base, and protruding into the lumen of the bowel about 1 cm. This mass had almost closed the opening into the diverticulum. The diverticulum contained an irregularly shaped enterolith.

The walls of the diverticulum consisted of the following coats:

1. Mucosa, markedly atrophied around the proximal end of the lumen, where pressure had been greatest from the thickened gut walls, and fairly well-preserved around the sacular portion.

2. Submucosa, a strong fibrous coat thicker in the proximal than distal portion.

3. Muscularis, fibers derived from the circular coat of the sigmoid, and thickened by fibrous infiltration to twice the thickness of the same coat in the normal portion of the sigmoid. The muscularis in the sigmoid wall, where penetrated by the diverticulum, was much thicker.

4. A layer of fibrous tissue from the subserosa.

Case 2. (16736.) The portion of sigmoid removed was about 20 cm. long and 7 cm. thick. The lumen was so reduced that it was with difficulty that a glass rod 1 cm. in diameter could be passed through it. The specimen had the roughened external appearance and hard nodular feel of a carcinoma of the sigmoid. Sections showed the walls to consist, besides the thickened muscularis, of a fat-infiltrated, inflammatory mass, mostly in the subserosa, and containing multiple diverticula. On dissecting away the tissue from about the diverticula (Fig. 4), they were found to be small, thin-walled, and many of them containing in their sacculated extremities, hard, black enteroliths. Examination of the walls of 10 of the diverticula showed no muscularis whatever. Their hernial nature was further shown by the fact that all had penetrated the haustra of the sigmoid well away from the teniæ of the longitudinal muscularis. Careful examination of the circular muscularis showed areas of marked thinning, even where no diverticula had developed. None of the diverticula gave evidence of marked inflammation within the lumen.

Case 3. (18856.) The portion of the sigmoid removed was about 15 cm. long and 5 to 8 cm. thick. The diameter of the lumen was much reduced. The wall

[2] The accompanying pictures representing types of this condition are to be viewed through a stereoscope.

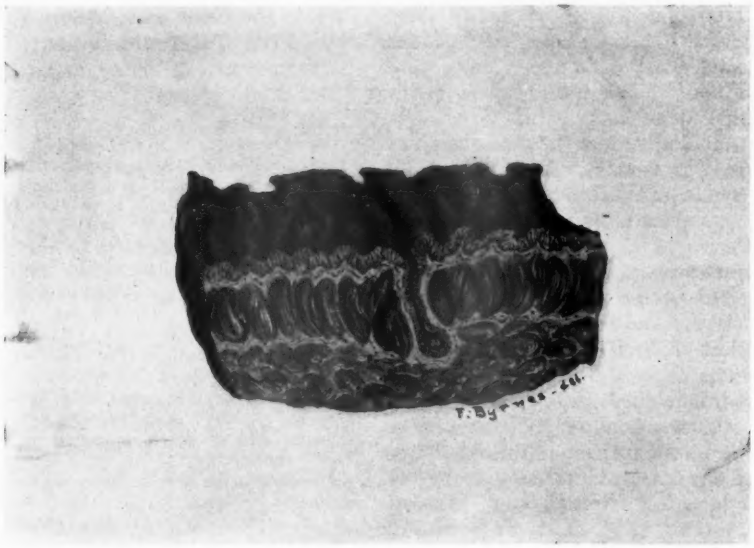

Fig. 9. Peridiverticulitis. Case 4. (19305.) x1 diam. Sketch of diverticulum with inflammatory deposit in subserosa.

showed the results of a chronic inflammatory process in its thickened submucosa, muscularis, and subserosa, the latter being infiltrated with fat. There was marked hyperplasia in all the glands removed. Immediately after the operation, a large portion of the inflammatory mass was divided into blocks for histologic examination, both in this laboratory, and in the laboratory of the patient's home physician, so that the exact number of diverticula penetrating the sigmoid wall was not accurately determined. However, when the specimen was later dissected, 2 typical examples of small, false diverticula were found (Fig. 5). One of these contained an enterolith. The other, though sacculated, contained none. There was no evidence of inflammation within the lumen of either. The walls of both were quite thin and devoid of muscularis. Besides these 2 fully developed diverticula, several small pocketings of the mucosa were present. At each of these, the circular muscular fibers were markedly fewer than in surrounding areas.

CASE 4. (19305.) The resected portion of the sigmoid in this case was about 17 cm. long and 6 cm. thick. The thickening was due to chronic inflammation, principally in the muscularis and subserosa, into which had penetrated numerous diverticula (Fig. 6). The circular muscular coat contained many thinned areas, in some of which, indeed, the muscular fibers seemed to be entirely absent. In these there was always pocketing of the mucosa and submucosa with usually compensatory hypertrophy of the inner fibers of the subserosa.

All the diverticula were small, with more or less atrophied mucosa (Figs. 7 and 8, and Sketch 9), thickened submucosa, and no muscularis. Their distal ends were well surrounded with the markedly increased fibers of the inner portion of the subserosa. Many contained enteroliths. None showed inflammation within the lumen. None perforated into the bands of longitudinal muscle fibers. Recent infection with B. tuberculosis was demonstrated in the enlarged glands in the specimen, and later elsewhere in the peritoneum when the case came to autopsy.

CASE 5. (20202.) The specimen of sigmoid in this case was removed 13 days after its fixation (2-stage Miculicz operation) and was consequently too necrotic to permit of satisfactory histologic or gross anatomic examination. Its general appearance is shown in Fig. 10. It was about 20 cm. long and 10 cm. thick. The walls were thickened with old inflammatory deposits about numerous diverticula. The diverticula were all small and apparently devoid of muscularis in their walls.

SUMMARY

It will thus be seen that of the 5 specimens herewith reported 1 contained a true diverticulum and 4 only false diverticula. It is possible that the true diverticulum (Fig. 3) may have been congenital, though the relation of the layers of its wall to those of the sigmoid makes the supposition scarcely tenable. One diverticulum (Fig. 2) in this case had formed a sloughing ulcer, simulating in its symptoms and in its gross anatomy an ulcerating carcinoma.

The diverticula in the other 4 cases were all of the small, multiple, false variety. All were simple herniæ of the sigmoid walls passing through the circular muscular coat at points where its fibers were deficient. It was impossible to determine accurately whether this deficiency of the muscularis of the sigmoid walls was congenital or the result of atrophy from the pressure of fecaliths or constipation. It would seem, however, that a congenitally defective musculature slowly yielding to increased internal pressure, would readily produce the anatomic conditions found.

The large inflammatory deposits about the diverticula were undoubtedly caused by chronic leakage through the diverticular walls. It is noteworthy that this inflammatory reaction was much greater around those diverticula which extended well through the muscularis, and which contained enteroliths. This is well shown in Fig. 7, an enlarged view of a portion of the sigmoidal wall in Case 4. Here is seen a small diverticulum protruding well through the muscularis and containing within its almost occluded lumen an enterolith. Around it is an inflammatory mass three times as thick as that around a much larger diverticulum in its immediate neighborhood, but which scarcely penetrates the muscularis, is still well open into the lumen of the sigmoid, and contains no hard fecal concretion. This one section would seem to go far toward explaining not only the etiology of the diverticula but also of the secondary peridiverticulitis.

It would seem worth while to draw a sharp distinction between the acute ulcerative process within the diverticula in Case 1, and the chronic inflammatory process confined to the tissues surrounding the diverticula in the other cases. The former is a lesion, primary in the mucosa, caused by bacteria to which it is not immune; the latter, only an inflammatory reaction of the peritoneum set up by the leaking through the diverticular walls of toxins, or bacteria, with the presence of which the mucosa is constantly familiar. The former causes no material reduction of the lumen of the bowel; the latter, a very marked reduction with chronic obstruction. The former tends to acute perforation into the peritoneal cavity, while in the latter, the reparative process is so predominant that rarely should perforation occur. Finally, if we are to speak accurately, we should apply the term "Diverticulitis" only to cases of the former type, that is, *acute inflammations of the mucosa within the diverticula*, while the cases of the latter type, that is, *chronic inflammations of the subserosa around the diverticula* should be designated "Peridiverticulitis."

THE CLINICAL COURSE OF ACQUIRED DIVERTICULITIS OF THE LARGE INTESTINE. By Dr. H. Z. Griffin

Acquired diverticula may be, "true" or "false"— the "true," consisting of all the layers of the intestinal wall, the "false," being hernial protrusions of mucosa through musculature. Traction caused by tumors, or by adherent organs, is probably the most common cause of the "true" variety. The "false" are most likely the result of excessive pressure from within the intestine, combined with a congenital weakness of the bowels.

Acquired diverticula of the large intestine are more common than those of the small, and pathologic change occurs in them much more frequently. They are usually multiple and may arise from any part of the surface. Some authorities have tried to show that the mesenteric border is the weakest part of the bowel, and that diverticula form here more readily. This seems to be true in the dead bowel, when blood-vessels are not distended and resistant, but the experiments of Chlumsky (1) demonstrate that upon distension of the living bowel, rupture generally occurs at some point opposite the mesentery.

Diverticula often extend into the epiploical appendages and may account for some of the tenderness found in many portions of the gut.

According to a table compiled by Gordinier and Sampson (2), acquired diverticula of the large intestine were recorded in 64 examinations out of 8,132 autopsies, at the hospital of the city of Dresden; in 19, out of 2,600, at the Johns Hopkins Hospital; in 2, out of 953, at the Bender Hygienic Laboratory, and in 1, out of 2,382 at the Boston City Hospital. It is probable that general interest and careful investigation will show that they occur much more frequently than supposed.

ETIOLOGY

Constipation is considered an important factor in the production of diverticulitis. Hardened feces, becoming impacted in a diverticulum, may be the cause of beginning irritation, and possibly of ulceration. This is probably one reason why diverticula of the large bowel undergo pathologic change so much oftener than those of the small; and why the sigmoid is so commonly affected.

Most of the cases occur in persons beyond middle life; the majority are over the age of 50. The fact that this is the cancer age is productive of obscurity in diagnosis. One of our probable cases, whose age was 39 at the time of examination, gave a history of trouble beginning at 15. All other cases were of more advanced age, and of much shorter duration — 11 days to 2 years. There is apparently no particular reason why some disturbance should not occur early in life, nor why the cases should not be of longer duration.

There seems to be a notable general tendency to obesity. One might conceive this to be a proper concomitant of weakened intestinal musculature.

Chronic passive congestion has been mentioned as a factor in the production of diverticula themselves and also in the causation of disease in them. Dilated veins give a sieve-like character to the intestinal walls and internal pressure may cause herniæ through the weakened areas. Moreover, after diverticula are formed, improper nourishment will foster inflammatory change.

At our clinic, 5 cases have been seen in which, after resection, the diagnosis has been made certain by pathologic examination. Indeed this is the only way in which one can arrive at a positive diagnosis.

CASE 1, was operated upon May 1, 1902, for supposed carcinoma of the sigmoid. O. A., male, aged 41, first noticed a tumor in the lower left part of the abdomen, 5 months before admission to the hospital. The patient had lost 30 pounds, was anemic, and practically all of the 5 months had suffered with pain in the lower part of the abdomen. There had been no urinary disturbance. A tender, hard, irregular, but movable mass was discovered in the left lower quadrant. Six inches of the sigmoid and descending colon were resected. The distal end of the bowel was closed, dropped in, and an artificial anus formed by the upper end. The patient was discharged in 18 days, evidently in a satisfactory condition.

CASE 2. J. W., a woman, aged 62, was examined by Dr. C. Graham on November 18, 1905, having been referred by Dr. Caldron of Mumford, Iowa. Her family history was negative, and she had passed through her menopause at 52, during which time there had been considerable uterine bleeding. For a few years previously there had been noticed at times a sensation of pressure in the lower abdomen, which was relieved only by drastic catharsis. Pelvic pains of an indefinite character had been complained of for a year. On the whole, however, the history was rather negative. Examination disclosed a moderately large mass low down in the left side of the pelvis, and a tentative diagnosis of ovarian tumor was made. At operation, the mass was found to arise from the sigmoid. A resection of 8 inches of the bowel was performed and followed by an end-to-end suture anastomosis. A pathologic diagnosis of fibro-lipoma, diverticula, with ulcerating fecaliths, was made. The patient recovered satisfactorily.

It will be noted in this case that there was considerable history of constipation. There had been no attacks of abdominal pain, however, and instead of a mass being found in the left iliac fossa, there was one in the left side of the pelvis. These same points may be noted in Case 4, a woman; and in Sampson's case, also a woman. The male patients we have seen presented a mass higher up. This may be due to the fact that the woman's pelvis is roomy and the sigmoid movable.

CASE 3. J. W., male, aged 55, weight about 150 pounds, was examined on June 19, 1906, by Dr. W. J. Mayo. The patient gave a history of some gastric flatulence for a year preceding. On June 2 he had noticed some general abdominal pain. Two days later he had a slight chill, and his temperature rose to 101½°. A tender sausage-shaped tumor was discovered in the left iliac fossa. There had been no severe, acute, abdominal colic. General pain and localized tenderness continued, and the mass gradually decreased in bulk, until at the time of examination it was about one half of its original size. The patient was 8 pounds under weight. At operation, 7 inches of the sigmoid was resected for fibro-lipoma, secondary to an ulcerating fecalith. An uninterrupted recovery followed and the patient is now doing well.

It will be noted in the above case that the onset was sudden and the formation of tumor rapid. The attack of abdominal pain was not as sharp as in appendicitis, nor was there vomiting. Indeed, the absence of vomiting seems to be a common thing, unless the attack of pain is very acute.

CASE 4. W. J. M., a woman, aged 52, was examined by Dr. C. Graham on July 31, 1906. She had had typhoid fever 25 years previously. There was a history of marked obstruction and it had been nearly impossible to secure bowel movement. Five years before there had been an operation for ovarian cyst, and some complaint had continued ever since. Intermittent stomach trouble of a mild degree had existed for years. The patient had suffered from periodical attacks of pain across the lower bowel for 5 or 6 months, these spells lasting 4 or 5 days, never severe, and not accompanied by vomiting. She was 25 pounds below her normal weight. Examination disclosed a left-sided pelvic tumor. At operation, which was done mainly on account of obstruction, the mass was found to be in the sigmoid. This was resected. Pathologic examination revealed a large number of diverticula, some of them ulcerating. There were tuberculous glands upon the peritoneal surface, apparently a secondary infection. The patient died 18 days after operation from general peritonitis, as postmortem examination showed.

CASE 5. W. S., aged 52, male, was examined by Dr. H. S. Plummer on January 19, 1907. Five months previously he had, for a week, complained of some pain and nausea. About 3 weeks before the examination, the patient was attacked with severe pain and some fever, lasting 2 days. There was no constipation and no blood was to be seen in the stools. Dr. Truesdale of Fall River, Massaschuetts, who referred the case to us, had found a mass. There had been a loss in weight of about 26 pounds, with symptoms of obstruction. The patient was very well-nourished, weighing over 200 pounds. The possibility of diverticulitis was mentioned upon the clinical report. At operation, 10 inches of the descending colon and sigmoid were resected. The patient died on the thirteenth day, of general peritonitis, as was shown by postmortem.

Beer (3), in 1904, collected 18 cases of inflammatory disease of the large bowel. S. C. Plummer (4) reported 1 case in 1906. The addition of the above 5 cases of undoubted diverticulitis makes a total of 24. Many cases are reported which in the light of present experience might be considered diverticulitis. Surgeons have at times explored the abdomen, and finding what seemed to be an unremovable carcinoma of the sigmoid, have sewn up, expecting a progressively downward course. To their surprise, a marked improvement has followed. The mass has gradually disappeared and the patient occasionally attained even perfect health.

In other instances a colostomy has been made above a supposedly malignant obstruction, and a surprisingly great improvement has followed. Some of these cases have even been reported as cures of cancer. On the other hand, one must be careful not to consider every left-sided pain as evidence of this malady, until we have seen a greater number of positive instances and have become more familiar with the milder symptoms.

The foregoing 5 cases must be distinctly separated from the following group of probable cases. Pathologic examination is the only basis for a positive diagnosis. Even macroscopically, at operation, one cannot surely differentiate it from carcinoma. However, the following 4 cases which have come under our observation, simulate diverticulitis so closely that a report of them ought to be of some value.

CASE 1. The history was kindly furnished by Dr. John W. Bell of Minneapolis. O. C. W., male, aged 70, became suddenly ill with chill, fever, and vomiting on February 24, 1906, and a mass was discovered in the region of the sigmoid, on deep palpation. Upon operation an inflammatory condition was found about the sigmoid, and there were adhesions, especially to the bladder. These were freed. The patient recovered and is now in excellent health.

CASE 2. H. C. C., a physician, weight 240 pounds, was examined by Dr. H. Z. Giffin, in July, 1906, and presented an unusually interesting history. The patient's father had died of carcinoma, and the mother of tuberculosis. The patient had been healthy until his fifteenth year, when he had had an attack which was essentially like appendicitis, save that the localization was in the left iliac fossa. Between the ages of 15 and 20 he experienced intermittently mild paroxysms of pain in the left lower quadrant. When 20 years of age he was put to bed for 5 weeks with a fever of 104° and 105°, chills, vomiting, distension, obstinate constipation and severe abdominal pain. After this his general health was good until he was 32 years old, when there occurred another attack of abdominal pain, with vomiting and fever, and localization in the left iliac fossa. This was similar to the attack he had had at 15. In 24 hours a mass as large as a child's head had formed in the region of the sigmoid. Under medical treatment, it disappeared in 4 weeks, and was thought to have been an abscess which had discharged by the bowel. The patient was then quite well for a year. When 33, he was kicked in the abdomen by an insane patient, and a small mass formed in the left iliac fossa. There was a large quantity of pus discharged by urethra. This material was examined every day for a month, but no tubercle bacilli could be found. The patient recovered again under medical treatment, but for some months following, there was an occasional fever; then the patient was well for 4 years. On May 3, 1905, he had his third sharp attack, which resembled appendicitis, but with the localization on the left side. A mass formed in 3 days. Cystoscopic examination and catheterization of the ureters showed only some red-

ness of the left side of the bladder. An abcess was drained by Dr. J. F. Erdman of New York. There was a marked improvement and the patient went back to work, but the sinus had persisted to the time of examination. In October, 1905, 5 months later, there was a fourth attack. A diagnosis of appendicitis with left-sided abscess was made. A median incision by Dr. Erdman disclosed a normal appendix. A small amount of pus was obtained and the sinus resulting from this had also persisted up to the time of examination. Occasionally there had been a discharge of material having a fecal odor, and twice fecaliths had been obtained. The bowels had been moving quite satisfactorily and the patient was very well-nourished, markedly inclined to obesity, and able to work, having lost but 3 days on account of a mild attack of pain and fever since examination. The fistulæ still exist.

CASE 3. M., a Bohemian, 51 years of age, male, presented himself in 1896, with symptoms of an entero-vesical fistula. There was a history of symptoms similar to appendicitis, save that the localization of pain was on the left side. His condition improved for a while, but later became worse, and a mass which was quite tender developed in the left side of the abdomen, low down. A discharge of pus with a fecal odor occurred by urethra, and continued though the bowels were moving naturally. A diagnosis of appendicitis with left-sided abscess was made. At operation, however, the appendix was found to be normal but in the pelvic portion of the sigmoid there was a moderately large sausage-shaped tumor imbedded in a mass of adhesions and attached to the bladder. This was stripped away, and an attempt made to close both the bladder and the bowel openings. Combined fecal and urinary fistula developed in a week. The urinary fistula healed by granulation rather promptly, but the fecal fistula persisted, and when the patient was last seen 2 years afterward, there was still occasional discharge of gas and hardened fecal masses.

CASE 4. P. V. R., a clergyman, 63 years of age, weighing 260 pounds. The history was furnished by Drs. J. B. McCaughey and W. F. C. Heise of Winona, Minnesota. The illness dated from August, 1905, when there were occasional attacks of moderately severe pain across the lower abdomen, associated with diarrhea. These attacks grew worse in December, 1905, and in January, 1906, he was taken down with fever ranging from 99° to 102°, which continued 3 weeks. During this time there had been 2 spasmodic attacks of pain which required morphia. The pain was localized in the left inguinal region, and seemed as though it might have been due to a stone passing through the ureter. There was, however, no blood nor gravel in the urine. After the disappearance of the fever, there occurred a third similar attack. The pain continued intermittently during the spring, and in midsummer the patient started for Europe in the hope of improving with change of scene and climate. In August the pain became worse, and during the latter part of September a swelling and a tender area developed in the left inguinal region. The patient's physician in Berlin advised him to return home. Upon his arrival in the latter part of October, he was found to be 20 pounds under weight, and an indurated area, apparently inflammatory, had developed along the course of Poupart's ligament, extending into the testicle. Upon lancing this, pus, blood, gas, and fecal matter, were obtained. Five or six days later an intestinal obstruction ensued and was relieved by colostomy on October 28, 1906 (operation by Dr. W. J. Mayo). There followed an immediate improvement both in local and in general conditions. Six weeks after operation the bowels moved, per rectum, for about 3 weeks. Since then the feces have passed per rectum intermittently. The pelvic abscess continued to discharge pus and blood until March 21, 1907. The colostomy wound has been gradually growing smaller. The patient complains of pain when constipated, and there is some hurry in urination. There was so much urinary disturbance at one time that a stone in the bladder was suspected. Cystoscopic examintaion was done by Dr. M. C. Millet, but proved to be negative. The patient has now regained most of his loss in weight, and is gradually getting back to his work.

We have presented five *positive* and four *probable* cases of diverticulitis. All of the positive cases and most of the probable ones were over 40 years of age, and all were within the common cancer limit. Of the positive cases, 2 (women) presented left-sided pelvic masses with obstructive symptoms. And in 3 cases (men), there were left iliac tumors with abdominal pain localized in the left lower quadrant. The history of acute attacks of abdominal pain, first general and then localized in the left iliac region, with or without vomiting, is striking.

Of the probable cases, 3 proceeded to abscess formation, and 2 had entero-vesical fistulæ. One caused a complete stenosis.

Beer (3) classified the cases which he had collected into: First, those which produced stenosis, of which there were 6 instances. Second, those in which perforation into the peritoneum had occurred. He draws attention to the fact that the sigmoid should be examined in all cases of perforative peritonitis, when in doubt as to the source. Third, those which led to abscess formation. Fourth, those with intestino-vesical communication. In 20 cases of these fistulæ, Chavannaz found 9 inflammatory, 5 tubercular, 4 carcinomatous, and 2 traumatic. The frequency of the inflammatory form will be noted. Fifth, those which seemed to show some causative relation between diverticula, mesenteritis, and volvulus, of the sigmoid. Sixth, instances of appendicitis in which diver-

ticula had been found in that organ. Seventh, those in whch carcinoma had apparently developed in false diverticula. Hochenegg (5) has reported one such case.

CLINICAL DIAGNOSIS

A clinical diagnosis of diverticulitis cannot be made positively. Left-sided pain, low in the abdomen, coming in spells, and associated with constipation, brings it to mind. The occurrence of a more acute abdominal pain, general at first, and later localized to the left iliac fossa, would suggest it very strongly. The rather sudden formation of a mass in the left lower quadrant, following such an attack of pain, would make the diagnosis yet more probable. Carcinoma would have been more gradual in growth, but this point cannot be relied upon from the fact that the patient may not have noticed such a mass at its beginning. The occurrence of blood mixed through the stools is an important sign in favor of carcinoma. Only one of our cases was correctly diagnosed.

The following case is instructive from a diagnostic standpoint. J. T., aged 53, was examined by Dr. H. Z. Giffin on July 30, 1906. There was an old history of stomach trouble, suggesting ulcer. Two weeks previous to examination, he had had a severe attack of epigastric pain, colicky in character, coming on and disappearing suddenly. Morphia was required. Three more attacks, lasting about 20 minutes each, followed during the day. Eleven days before examination the patient had noticed tenderness and the formation of a mass in the left lower quadrant. Repeated irrigation of the bowel failed to remove this. He had been having 6 or 7 stools a day, none containing blood. He had lost about 20 pounds in 2 weeks, but had eaten nothing. Sigmoidoscopic examination was negative, the mass being too high. The hemoglobin was 90 per cent.

From the above history one would have expected an inflammatory growth, but at operation a cancer of the descending colon and sigmoid was found and excised. It is impossible to tell even by the gross appearance of such a tumor, whether it is inflammatory or malignant. Microscopic examination alone can positively diagnose the condition. In women one must think of the possibility of diverticulitis upon finding a left-sided pelvic tumor, especially if associated with much bowel trouble.

Actinomycosis of the sigmoid may occur. Tuberculous peritonitis may be localized in this region. Appendix abscess may be left-sided and chronic sigmoiditis may cause a thickened and palpable gut. In these instances, the previous history will generally give a clue. It is also said that normal epiloical appendages may be enlarged, tender, and suggest the existence of a mass.

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CONTINUOUS PASSIVE HYPEREMIA IN DELAYED UNION OF FRACTURES AND IN HASTENING THE CONSOLIDATION OF FRACTURES[1]

By JOHN B. ROBERTS, M. D.
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TEN or eleven years ago I reasoned that physiologic processes made it probable that delayed union in fractures could be successfully treated by engorging the fragments of bone and their surroundings with venous blood. This I determined to effect by applying a rubber bandage with moderate firmness around the limb above the seat of fracture. I reported an instance of delayed union of the tibia and fibula so treated, to the section on General Surgery of the College of Physicians of Philadelphia in 1897,[2] and mentioned the subject elsewhere about the same time.[3]

When the report was made, the patient had worn the bandage for nearly three and a half months. It was used after waiting for two months for union, after resection of a fracture of the tibia and fibula, which had remained ununited for five months. The bandage was applied around the lower part of the thigh, and was worn day and night just tight enough to make the foot and leg blue and swollen from venous engorgement. The skin beneath the bandage was kept in good condition by occasional bathing with alcohol, and the use of a short cotton bandage beneath the rubber one.

The treatment with continuous hyperemia was supplemented by the employment of a gypsum splint, the administration of calcium salts, and walking with a cane. It seemed as though the method was of service, though it was not proved that such was the case. Consolidation of this fracture and of one of the other leg finally occurred.

So far as I knew the suggestion was novel, and was presented to the meeting with the hope that other surgeons would employ chronic hyperemia in the same manner in similar cases. Since that time I have continued to use the rubber bandage in delayed union or non-union of fractures, if there was no reason to believe that the difficulty was due to a mechanical impediment to union, such as interposed muscle or fascia. In the latter event, I examine the relations of the fragments through an incision. If necessary I then resect the ends and hold them in proper coaptation with nails or staples. As a second step I use chronic hyperemia more or less continuously during the progress of case. If the resection wound does not heal by first intention, it is probably well to obtain healing of the granulating ulcer before employing the congestion treatment. I think that the passive hyperemia, caused by the bandage, has a possible tendency to retard healing of the wound of the soft parts, very much as varicose veins of the legs have a tendency to keep chronic ulcers from being readily cured.

I have occasionally employed the congestion method in the treatment of recent fractures of the leg, but I do not know whether it has hastened union. The number of cases of ununited fractures which I see are few, and in both these, and in recent fractures, it is difficult to ascertain the exact value of the congestion treatment.

Some time after my first experience with this procedure, I learned that Helferich had already proposed the identical method. His elaborate article[4] was apparently not very familiar to American surgeons at that time, for there was little reference to it in text-books or journals. Helferich, by the way, says that von Dumreicher used a similar method, though by a more complicated dressing, a number of years before his own paper was published. My moderate advocacy of the method was likewise ineffective in securing clinical reports of cases. In recent years, however, I have noticed in American as well as German literature, rather frequent allusions to Helferich's suggestion.

[2] "Suggestion for Hastening Consolidation in Delayed Union of Fractures." Ann. Surg., Jan., 1898, p. 95.

[3] Manual of Modern Surgery, 2nd ed., p. 378.

[4] "Ueber künstliche Vermehrung des Knochenneubildung," Arch. f. klin. Chir., 1887, xxxvi, 873.

[1] Read before the American Surgical Association, May 7, 1907.

More interest has been felt in the subject no doubt because of the universal attention given to Bier's writings on congestion therapy.

The books familiar to American students in which accounts of the procedure are found are Stimson's edition of Tillmanns' *Surgery*,[5] Bloodgood's edition of Helferich's *Atlas and Epitome of Traumatic Fractures and Dislocations*,[6] and DaCosta's *Modern Surgery*.[7]

Helferich's technique is rather different from that which I have used. He applies a flannel bandage to the limb from the toes or fingers upwards to nearly the level of the fracture. Then he adjusts the rubber bandage around the limb a short distance above the lesion. These devices cause an engorgement of venous blood only in the vicinity of the fracture. My method has been to place the rubber bandage around the limb above the fracture, and permit the distal portion of the leg or arm to become engorged, except in so far as the gypsum splint or other apparatus interferes with that effect of the rubber constriction above.

It is interesting to observe how slowly this method of dealing with delayed union has attracted the attention of surgeons. When I made the suggestion, I thought it was novel. Yet Helferich had written on the topic years previously. Nicoladoni, moreover, as Helferich states, had written on von Dumreicher's similar method as far back as 1875.[8] von Dumreicher's reasoning was founded on the same physiologic premises as were Helferich's and mine. He, however, placed wedge-shaped compresses on the limb over the fragments — two just above and two below the line of break, with the bases of the wedges toward the fracture. These were held in place by strips of sticking plaster; and splints of wood were adjusted on top of them. The local hyperemia so obtained was used intermittently, for the wedges were removed from time to time. Curiously enough Nicoladoni, who describes the method, suggests the possibility of using the Esmarch elastic bandage for the production of the local hyperemia. He also employed the von Dumreicher dressing to hasten the formation of bone in a cavity of the tibia left by an abscess.

That congestion of the bones and surrounding soft parts conduces to consolidation of the fracture in cases of delayed union, is difficult to prove, at this time, with mathematical certainty. I have thought that it was a valuable method and have used it on various occasions. Da Costa quotes Buechner as stating that 10 days of almost continuous application of the rubber bandage cures most cases of delayed union. He himself thinks that he has seen the procedure do good. L. M. Kommel reports [9] a case of fracture of the tibia and fibula where no union existed after 8 weeks. Venous hyperemia was obtained by roller bandages applied above and below the seat of fracture for 2 hours daily, and phosphorous was administered internally. Union occurred within a month.

Tomaschewski says [10] that the congestion method of Bier has given him brilliant results in various inflammatory affections, and in defective consolidation after fracture.

I have of late employed this congestion method in recent fractures of the extremities with the hope that the ordinary period of consolidation may be shortened. My observations, however, have not been extensive or accurate enough to warrant a decided opinion as to its value. It is believed by some, I think, that fractures, in which there is a good deal of blood effused in the soft tissues about the seat of osseous injury, unite more quickly than similar lesions not so complicated. If this be true, passive congestion by damming blood in the injured region with a bandage, would seem a rational procedure.

Wessel [11] has confidence in this way of treating fractures. At first he applies the bandage for 22 hours every day or so; during the second week on alternate days, and during the third week on every third day.

Those specially interested in the topic will find much information in Bier's book on *Hyperämie als Heilmittel*.[12] He quotes especially the researches of Bum as showing that

[5] Surgery, Tillmanns, vol. i, p. 604.

[6] Ed., 1902, p. 53.

[7] Ed., 1907, p. 466.

[8] von Dumreicher's "Methode zur Behandlung drohender Pseudarthrosen." Wien. med. Wchnschr., Jan. 30, 1875, p. 80.

[9] Med. Rec., Dec. 16, 1905, lxviii, 980.

[10] Centralbl. f. Chir., xxxiii, no. 27. Abstract in J. Am. Med. Ass., 1906, ii, 1141.

[11] Hosp. Tid., xlix, no. 30. Abstract in J. Am. Med. Ass., Dec. 22, 1906.

[12] Leipsic, 1903, p. 161. Bum's articles will be found in Arch. f. klin Chir., 1902, lxvii, 652, and Centralbl. f. Chir., xlvii, 1901.

hyperemia from damming up the venous blood was efficient in producing callus in experimental fractures.

Although delay in union of fractures is not of very frequent occurrence, it is satisfactory to have at our service, for such cases, so simple a method of treatment as that under discussion. The evidence seems to show that artificial hyperemia is valuable when there is no actual mechanical hindrance to union, such as entanglement of the ends of the fragments in the muscles, interposition of fascia or necrotic bone, and malignant disease.

During the use of the elastic bandage, the patient should be given the benefit of good diet and fresh air, and of exercise out of doors, if possible. I always administer internally, in delayed union of fractures — and also in actual non-union — calcium carbonate and calcium lacto-phosphate. My custom is to give 5 or 10 grains of each in powder 3 or 4 times daily. Iron, quinia, and strychina, are frequently used coincidently as tonics. I believe that constant, or almost constant, out-of-doors life is of the greatest value, as is a happy and contented state of mind. Any special diathetic deviation from health should be efficiently treated.

A true pseudarthrosis may demand resection of the ends of the fragments and mechanical fixation with nails, staples, plates or suturing. So soon as the operation wound is closed, or nearly closed, the congestion method with the elastic bandage may be instituted. Its use immediately after operation might induce bleeding. In about a week union of the soft parts has been obtained, and there is no such danger. When there remains a superficial granulating ulcer after resection, I think that I have seen delay in its cicatrization from the continuous hyperemia. This may be more true when compression of the distal parts with a gypsum splint, or a bandage, compels the granulating surface over the seat of fracture to be unduly engorged with venous blood.

Helferich thought it unwise to use the elastic constriction to produce local hyperemia, when inflammatory symptoms are present. If, however, Bier's use of this method in inflammation and other infections becomes an established procedure for their cure, it would seem that, even in fractures with infection, continuous hyperemia would not be contraindicated. At any rate the consolidation of callus is of more importance in delayed union, than the inconvenience resulting from a retardation in the healing of a coincident ulcer of the soft parts.

Care must be exercised not to make the elastic bandage too tight. It should be applied just firmly enough to induce a little bluish swelling of the limb below. It should give no pain. I usually wrap it about a half a dozen times around the limb, protecting the skin from the irritation of sweating by applying first a few turns of a cotton bandage. The patient is instructed to loosen it if it hurts. The surgeon must supervise the matter a little, lest the patient make it so loose that no hyperemia is maintained. After the latter has had the limb hanging down for a few hours, the bandage may become too tight and need to be relaxed a little. After lying down for a time the patient may need to tighten it.

The bandage should be from $2\frac{1}{2}$ to 3 inches wide and from 2 to 4 feet long, according as it is to be used for wrist, arm, leg or thigh. A bandage of good flannel, which is moderately elastic, or a pair of suspensers made of elastic webbing, will probably answer as well as a pure rubber bandage. The place of constriction may be shifted from time to time; and the underlying skin may be rubbed with alcohol occasionally. The bandage may have eyelets in it to enable the patient to fasten the terminal tape at definite places. I have used the congestion method more or less continuously. Others seem to prefer to remove the bandage occasionally. Which method is preferable is not known. It should be remembered that the bandage dams up the lymph as well as the blood; and that edema of the distal parts is not desirable. A slight bluish venous congestion is all that is desired.

ANEURYSMAL VARIX[1]

A Case of Pulsating Exophthalmos and Two Cases of Enormous Dilatation on the Cardiac Side of the Wound, and One Case of Moderate Dilatation on the Same Side

By GEORGE TULLY VAUGHAN, Washington, D. C.

ARTERIO-VENOUS aneurysms include two varieties known respectively as *varicose aneurysm*, in which the artery and vein communicate with each other through a sac or aneurysm, and *aneurysmal varix*, in which the communication is immediate, without the medium of a sac.

Naturally such conditions occur most frequently where large arteries and veins run in close relation to one another, as in the thigh, the arm, the neck, where traumatism seems to be the invariable cause, such as the passage of a bullet, knife blade, or other weapon, between the two vessels, wounding both and causing a communication at once or later, after distention and giving way of the coats of the vessels. There is one situation where a wound, or rupture of the artery alone, leads to direct communication between the artery and vein — where a large artery runs within a still larger vein, namely, the internal carotid artery in the cavernous sinus. Here the wound may be caused by a fragment of bone in fracture of the base of the skull, or by a rupture of the artery, which may or may not have had an aneurysmal dilatation on it, into the cavernous sinus as the result of a blow or strain. The influx of arterial blood, under high pressure, into the venous current of low pressure going in the opposite direction, causes obstruction to the current in the ophthalmic veins leading to dilatation of those veins, congestion, edema and swelling of the parts drained by them, and to proptosis and pulsation of one or both eyeballs — a condition to which the name of *pulsating exophthalmos* has been given. Pulsating exophthalmos may be caused by several conditions, but the most common cause seems to be a communication between the internal carotid artery and the cavernous sinus — a fact mentioned by Rivington, more than 30 years ago, when he found in 12 necropsies on pulsating exophthalmos subjects, 6 cases in which there was such communication. Other causes are aneurysm of the internal carotid in the cavernous sinus, without communication with the sinus (case of Barnard and Rugby, *Annals of Surgery*, May, 1904), although, according to Rivington, such aneurysms may exist without symptoms of pulsating exophthalmos, in proof of which he quotes the cases of Holmes and of Hutchinson, respectively,— simple dilatation of the internal carotid artery, and aneurysm of the ophthalmic artery. Certain vascular tumors, as angioma and sarcoma, may give some of the symptoms of pulsating exophthalmos, and in about 25 per cent of the cases no lesion of the artery has been found on postmorten examination (Wilder, *Transactions American Ophthalmologic Society*, 1907). Both eyeballs may be affected, although the lesion may exist on only one side, owing to the free communication between the two cavernous sinuses through the medium of the circular sinus. The symptoms are well shown in the following case:

Right pulsating exophthalmos — probably arteriovenous aneurysm of the internal carotid artery and the cavernous sinus. Ligation of the internal carotid. Death. This patient, a woman aged 53 years, who was usually nauseated when traveling on cars, was taken ill while traveling by rail 6 weeks before I saw her. The symptoms were nausea and violent vomiting, during which she felt something give way in the right side of the head about the ear, followed by a rushing sound which has continued ever since. The nausea and vomiting continued for several days after reaching home and soon the eyes began to protrude, especially the right. I was called in by Dr. S. M. Burnett, and found the patient in bed, in a highly nervous condition, being unable to eat or sleep with any satisfaction, moaning, and refusing, on account of the pain, to permit anything like a thorough examination of the eyes. The pulse was 75 and there was no evidence of heart or lung disease. On examining the head, immediately or with a stethoscope, a loud blowing sound, closely approaching a whistle was heard all over the head and half way down the right side of the neck, the maximum intensity being in the temple behind the right orbit. A distinct thrill could be felt over the upper half of the great vessels of the right side of the neck, and a marked pulsation was

[1] Read before the American Surgical Association, May 7, 1907.

visible on the same side — worse on the left. The eyeballs protruded so that the lids could not close over them — the right protruding more than the left — and both pulsated. The patient not only suffered pain in the eyes and head but was annoyed by the loud blowing sound which never ceased.

A diagnosis of aneurysmal varix between the internal carotid artery and cavernous sinus was made and operation advised.

Under chloroform the common carotid artery was exposed at its bifurcation, and Dr. Burnett was requested to note the effect on the sound by auscultation over the temple. Compression of the common carotid stopped all sound and abnormal pulsation; so did compression of the internal carotid, therefore the latter vessel was ligated about three fourths of an inch above its origin. The patient was put to bed in good condition with a pulse of 80. In an hour or two she recovered from the anesthetic, vomited a little, spoke a few words complaining of burning in the neck, and soon became unconscious again. Next morning she was still unconscious, pulse 100, breathing good, eyes about normal as to swelling, no pulsation, and no bruit. At 5 P.M. there were signs of left-sided paralysis, pulse 110. Death occurred next morning about 42 hours after the operation.

As there was no necropsy it cannot be stated with certainty whether death was caused by pressure of a blood-clot or by cerebral anemia. The interval of consciousness on recovery from anesthesia, followed by unconsciousness, would argue in favor of blood-clot, while the hemiplegia showing that a large portion of brain was affected — larger than could be involved by the pressure of a clot in the cavernous sinus — would indicate cerebral anemia, the more likely cause of death. The risks of operation are given as follows: (1) Infection; (2) Hemorrhage, immediate or secondary; (3) Cerebral complications; (4) Blindness on the affected side — partial or complete.

Erichsen, quoted by Barnard and Rugby (*Annals of Surgery*, May, 1904), says that cerebral complications occur in 25 per cent of the patients operated on. It is difficult to imagine how any other method of treatment in this patient could have been followed by a more favorable result. Digital compression could not have been tolerated by the patient; ligation of the common carotid would have been equally as, if not more, dangerous than the operation performed; and ligation of the common carotid, the external carotid, and superior thyroid, all at once — Legouest's method as practised by Ransohoff (SURGERY, GYNECOLOGY AND OBSTETRICS, August, 1906)—would have been still more dangerous in more effectively preventing collateral circulation, and in producing cerebral anemia.

Aneurysmal varix of the right femoral artery and vein, with enormous sac composed of the femoral and iliac veins. This patient was a white man, aged 31 years, whom I exhibited to my classes in surgery in April, 1904. His family history is unimportant. When 11 years old he accidentally stabbed himself with a long-bladed jackknife, about 10 inches above the right knee on the inner side of the thigh. Hemorrhage was severe at first but it was soon checked by pressure, the wound healed, and no further trouble was felt until 3 years later when he noticed a peculiar throb at the point of injury. Shortly before this time varicose veins began to appear below the knee and then ulcers. When 19 years old he was operated on for varicose ulcers, some of the veins below the knee being cut and tied, according to his statement, without improvement. All this time his right thigh, hip, and iliac region were getting larger, and when 21 years old he began the use of cocaine — having been told by several surgeons that his case was inoperable and believing that as he had only a short time to live, he might as well be comfortable. He has been using cocaine ever since.

Present condition. Numerous varicose veins, some of enormous size, are seen extending from the foot up to the ribs and the entire extremity is enlarged. Thrombi, with calcification, can be felt in some of them. A pulsating swelling is seen and felt along the femoral vessels, with a thrill and bruit most marked about the middle of the thigh. This seems continuous with a very large swelling of similar character, which occupies almost the entire right iliac region and extends upward nearly to the ribs.

This patient was undoubtedly for many years a favorable case for operation, and even now a cure might result by cutting off the communication between the femoral artery and vein, either by arteriorrhaphy or by ligation of the artery. The pulsating swelling along the femoral vessels and in the iliac fossa could be nothing else than the enormously dilated femoral and iliac veins, and perhaps some of their branches. Cutting off the entrance of the arterial blood would so lower the pressure in these venous sacs that they would probably return, almost if not quite, to a normal condition.

The remarkable fact that the dilatation of the veins is on the cardiac side of the wound, in the direction of the feeble venous current, rather than on the distal side of the wound, in the direction of the strong arterial current, will be discussed after reporting the next cases.

Aneurysmal varix of the right common carotid artery and internal jugular veins. Enormous dilatation of the vein. The patient was a colored male, 58 years old, and a laborer. Nothing noteworthy in his family history. General health always good; he had had the usual diseases of childhood, denied venereal disease. Twenty-three years ago he was struck on the right side of the neck by a stone which cut through the skin, in the region of the right carotid artery, and caused hemorrhage. He continued at work but at the end of 2 hours he had lost so much blood that he became unconscious. A surgeon was called and the wound was sutured. He seemed to make a good recovery from this injury, but 9 years later he was injured in the same region by a blow from a piece of timber. A scar is visible in this region. Nothing unusual was observed then, but later he was attacked by occasional paroxysms of sharp lancinating pain in the cervical region, and after the lapse of one year he first noticed the presence of a small pulsating swelling on the neck near the jaw, which gradually and progressively increased in size to about 3 years ago when its growth became much more rapid. As the swelling increased in size dysphagia and tinnitus aurium came on and dyspnea which was not relieved by lying down. Hearing in the right ear is impaired, and he occasionally has palpitation of the heart accompanied by a spasmodic "fluttering" in the neck. The skin over the swelling is normal, the anterior and posterior jugular veins are dilated and distended. The space between the lower jaw and clavicle is filled by a large swelling, almost round, extending from 2½ cm. below the ear to the clavicle; circumference at base 47 cm.; semicircumference longitudinally, 20 cm.; semicircumference transversely, 27 cm. On palpation a thrill and expansile pulsation synchronous with the radial pulse are felt. Strong compression almost empties the sac but on relaxation it immediately refills. There is dulness on percussion. On auscultation a low, harsh murmur is heard, loudest at a point one inch below the ear over the carotid arteries — loudest during systole but continued through diastole. The murmur is heard all over the chest, especially on the right side where it obscures the vesicular sounds. The heart is much hypertrophied and has a strong heaving impulse. No evidence of sclerosis of the arteries.

Fig. 2. Aneurysmal varix, anterior view — communication between artery and vein, just proximal to bifurcation of artery. Sac stuffed with cotton. Carotid artery had shriveled from drying. *a,a,a.* Internal jugular vein. *b,b.* Common carotid artery. *c.* Arteria innominata. *d.* Bifurcation of common carotid artery. *e.* Pneumogastric nerve. *f.* Communication between artery and vein.

Fig. 1. Aneurysmal varix of right common carotid and internal jugular vein.

A diagnosis of aneurysm of the carotid artery was made and operation advised. Under ether the operation was begun, a pillow being beneath the patient's shoulders in order to make the neck prominent. The pulse was strong but somewhat rapid, 120. My intention was to expose the great vessels low in the neck and control the circulation by means of padded forceps on the carotid artery. An incision was made over the swelling from above downward to the sterno-clavicular articulation where it was joined by another incision along the upper border of the clavicle; the anterior and external jugular, and inferior thyroid veins, were doubly ligated and divided, and the angular flap thus made, including part of the origin of the sterno-cleido-mastoid muscle, was turned up exposing the sac which was seen to have a very dark color. About this time the pulsations in

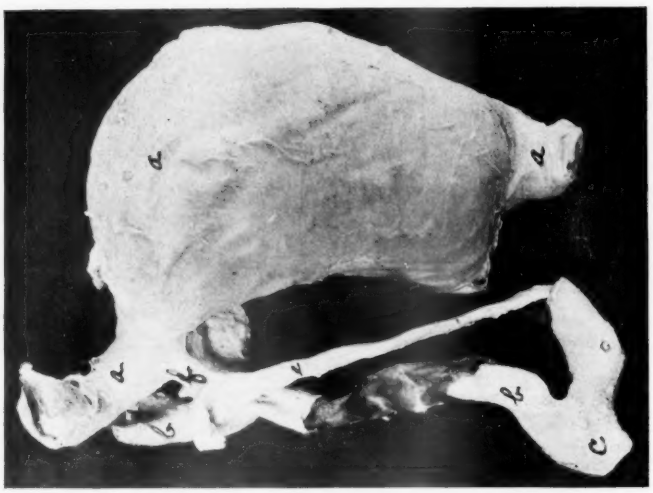

Fig. 3. Aneurysmal varix of common carotid and internal jugular, posterior view—sac formed by enlargement of internal jugular.

the swelling were observed to be weaker and slower than they had been, having fallen from 120 to 80 a minute and at the same instant respiration ceased. Artificial respiration was tried for a long time without success, although the heart continued to beat feebly for between 5 and 10 minutes after respiration had ceased. As there had been no injury to the phrenic, pneumogastric, or recurrent laryngeal nerves, and there had been no loss of blood, death was attributed to the anesthetic, ether. A partial necropsy showed that the swelling was caused by the enormously dilated jugular vein which communicated with the common carotid artery about 2 cm., proximal to its bifurcation by a round opening, large enough to admit the tip of one's little finger. The vein, from this point of communication to the jugular foramen and below where it joined the subclavian, was dilated only slightly beyond its normal calibre. The aneurysmal sac was composed of almost the entire jugular vein, extending from about 4 cm. below the jugular foramen to within about 2 cm. of its union with the subclavian vein. An examination of the photograph submitted will give an idea of the nature of the condition.

Aneurysmal varix of the left femoral artery and vein, with the sac composed chiefly of the iliac vein. I saw this patient through the courtesy of Dr. T. N. McLaughlin. He is an officer in the U. S. Army, about 50 years old, and was wounded during the Spanish-American war, the bullet, a Mauser, entering the left thigh over the femoral vessels about one inch below Poupart's ligament and emerging behind. An aneurysmal varix developed very soon, and on examination, 8 years later, the following signs and symptoms were noted: On auscultation a low murmur is heard most distinctly over the region of the old wound, but it can be traced downward along the vessels as far as the popliteal artery and upward as far as the aorta. On palpation a strong pulsation and thrill are felt over the vessels extending some distance above and below. An oblong pulsating swelling can be felt distinctly extending upward for about 3 inches above the wound—evidently the dilated external iliac vein.

This I regard as another favorable case for operation by arteriorrhaphy and venorrhaphy, or by pressure on the femoral artery, or by ligation of the external iliac artery in combination with arteriorrhaphy and venorrhaphy.

In the last three patients there was aneurysmal varix with dilatation of the vein on the cardiac side of the point of communication. One might think that the greater force of the arterial current would drive or hold back the weak venous current, and the result would be that the maximum of dilatation in the vein would be just at the point of meeting of the opposing currents, or on the distal side of this point, in the direction in which the arterial current flows. Two questions are suggested: First, is it the rule to have the maximum of venous dilatation on the cardiac side of the point of communication between the two vessels; and second, if so, what is the explanation? It would seem that the first effect of the entrance of the arterial current into the vein, in opposition to the venous current, would be

dilatation of the vein at that point as a result of the pressure of the *two* opposing currents. If the entire arterial current were turned into the vein the effect would be complete reversal of the venous current, and that portion of the vein distal to the point of communication would practically be converted into an artery as to the direction of its blood current. But only a part, perhaps a very small part, of the arterial current enters the vein, not enough to reverse the venous current, yet enough to increase considerably the blood pressure in the vein, and this pressure, according to the law of hydraulics, is transmitted equally in all directions — against the walls of the vein, with the venous current, and against the venous current. If there were no other force acting, and the resistance were the same on all sides, the effects of this pressure would be the same on all sides and there would be a general dilatation at this point; but the resistance is not the same on all sides. It is undoubtedly least in the direction in which the venous current flows, and greatest in the direction from which the venous current comes, so that the venous current, weak as it is, is yet strong enough to move the volume of blood in which this excessive pressure is being made, in the direction of least resistance which is that of the venous current. Thus the vein on the proximal side is subjected to excessive pressure until the force of the arterial current, so transmitted, is gradually exhausted. That there is some resistance to the venous current is shown by the varicose condition of the vein and often of its tributaries on the distal side. This resistance probably depends on the size of the opening of communication and the size of the arterial jet which enters the vein. Is it possible also, as suggested by Dr. Paul Johnson, that the *direction* of the opening or channel of communication may determine the direction of maximum dilatation of the vein?

RHINOPLASTY BY MEANS OF ONE OF THE FINGERS[1]

A Report of a New Method

By J. M. T. FINNEY, M. D., Baltimore, Maryland

THE object of this communication is to report two cases operated upon by me for reconstruction of noses that had been lost as a result of congenital lues. The method employed in these two cases differs from any hitherto described in the particular manner in which the finger is utilized, and in that it gives rise to no external scar. The bony support of the nose, including the septum, was entirely destroyed in both cases. The integument remained but was retracted and distorted. In each case, instead of the usual prominence of the nose, there was a depression.

In considering the possible methods of operative relief, it was evident that the classical methods familiar to all surgeons, namely, the Tagliacotian, the Indian, and the French, or modifications of them, all of which have to do only with a restoration of the integument, were not applicable in these cases. Other methods involving a reflection of periosteal and bony flaps from the forehead or cheeks, as suggested by König, Langenbeck, Ollier, and others, have the great disadvantage of giving rise to extensive scar formation and possible necrosis. Gold and silver wire, amber, and other substances, which have been from time to time recommended for use in forming a framework for the new nose, were discarded because of the fact that as foreign bodies, they give rise to more or less irritation, and sooner or later have to be removed. The injection of paraffin was clearly inapplicable, on account of the absence of any bony framework, and the thinness of the overlying integument.

The grafting of bone from animals, as suggested by Watson Cheyne, was not employed because of its evident liability to failure. The only remaining available source that suggested itself, from which to secure the necessary bony

[1] Read before the American Surgical Association, May 7, 1907.

Fig. 1. Photograph of patient before operation.

bridge for the nose, without causing great deformity, was one of the fingers. The method employed in making use of it was as follows:

The ring-finger of the left hand is selected as being the one best adapted for the purpose, and the one perhaps least missed from the hand. The nail and matrix are completely removed, the dorsum of the finger, up to the distal end of the first phalanx, denuded of skin. The tip of the finger, throughout its entire circumference, is also denuded of skin for about the distance of 1 cm. from the end, leaving the distal phalanx exposed, although not completely so. All bleeding is stopped. The skin covering the nose which is retracted and deformed, owing to cicatricial contraction, is then carefully freed from its attachments below, without making any external scar. The skin of the nose is then stretched carefully and thoroughly, by inserting the rounded end of a blunt instrument into the nasal opening, in order to give as much covering as possible for the new nose. The soft parts are next freed from the nasal process of the frontal bone, from within the nose, by a knife or instrument passed up through the nasal opening. The inner surface of the skin forming the nasal covering should be denuded on the inner side in the middle line, in order that a raw surface may be opposed to the denuded surface of the dorsum of the finger, described above, which is now inserted into the nasal opening, until the tip of the distal phalanx rests upon the nasal process of the frontal bone. The finger is held in place by sutures through the free border of the tip of the nose and the edge of the skin, over the dorsum of the first phalanx. Thus, we have raw surfaces opposed where we wish to secure the new blood supply for the finger, namely on the tip and dorsum, while skin covers the palmar surface of the finger, which is to form the inner lining of the nose. The hand is held in this position by adhesive strips and plaster-of-Paris bandages for two weeks; after which time the finger is disarticulated at the metacarpo-phalangeal joint, and left for another week; at the end of which time the tissues in the middle line over the nasal spine of the superior maxilla are split, the finger flexed to a right angle at its proximal-phalangeal joint, and the free end of the first phalanx then inserted into this opening, and held there by stitches through the soft parts. The first phalanx now forms the columna of the nose, while the second and third phalanges form a very satisfactory support for the dorsum. Later, smaller operations, under cocaine, are performed to improve the appearance of the columna which of course is too large, and if needed also upon the alæ.

Since bone has not been opposed to bone, the nose is freely movable from side to side, which

Fig. 2. Photograph taken after operation.

is of advantage in case of injury. The results in both cases have been very satisfactory.

In 1875, James Hardie reported a case of a young girl for whom he reconstructed a nose by making use of one of the fingers. This is the earliest recorded instance that I can find in which a finger was utilized for this purpose. His method in brief was as follows:

An incision is made on the palmar aspect of the distal phalanx of the left fore-finger with transverse incisions at its base. Two lateral flaps are thus reflected. The margins of the nasal cavity having been denuded, the flaps from the finger are applied to the edges and held in place by sutures, reinforced by adhesive straps. The patient was left in this position for three months, when the finger was amputated and the free end covered with the soft parts. Later the alæ were separated from the cheeks and attached to the lower end of the finger. The result in this case was not wholly satisfactory, as the healing was not per primam, and the finger later receded somewhat into the nasal cavity, so much so that the author proposed to cover it with a flap from the arm or cheek.

In 1879, Dr. Thomas T. Sabine, of New York, operated upon another case somewhat similar. This was reported by his house-surgeon, Dr. Vanderpool, in 1881. His operation was very similar to that employed by Hardie, namely, after a middle palmar incision, lateral flaps of skin were dissected up from the finger and attached on either side of the nose to the skin edges which had been freshly denuded for the purpose. The tip of the finger rested on the nasal process of the frontal bone, giving support to the bridge of the nose. A through-and-through silver wire was used to hold the tissues in place. The finger was amputated after seven weeks and the nose completed.

In 1895, J. A. Bloxam, of London, operated upon a case of marked deformity from lues. This had already been operated upon by the Indian method with only slight success. An attempt was next made to graft a recently amputated finger but this also failed. Lateral flaps were reflected from the finger as in the other methods. The nose was split down the center and the finger inserted, the lateral finger flaps being stitched to the nasal flaps. The finger was subsequently amputated in two stages after four weeks. The finger did not adhere well and a subsequent operation was necessary. The result was not entirely satisfactory.

In 1897, J. P. Tunis, of Philadelphia, reported a case of a woman suffering from the loss of a large portion of the right ala, and a small portion of the left, due to the application of cancer salves. The right ring-finger was used in this case in a manner similar to that described in the preceding cases. The finger was amputated at the end of three weeks and the result was satisfactory.

In 1902, Vredena, a Russian, described an operation which resembles very closely that described by Sabine. It differs from this, however, in that Vredena makes use of the entire finger, flexing the first phalangeal joint at right angles, and using the proximal phalanx as the columna. This procedure resembles our own method, except that in our method no incision is made through the skin, while in Vredena's, the nose is split in the middle line.

Volkovich, also a Russian, in the same year, reported two cases operated upon by a similar method, but no detailed account of the report was to be found.

The result in the first case, operated upon nearly five years ago, has been most satisfactory. The patient wrote me not long ago that he could go anywhere without attracting attention, or as he expressed it, "nobody now looks at me."

The second case, of which I present photographs before and after the operation, has a very satisfactory result with the exception that the ala on the left side has retracted somewhat, owing to the contraction of the old scar tissue. I shall do a small plastic operation under cocaine on this ala. I have waited until this time in order that it might contract all that it was going to.

In the second case, owing to the shortness of the phalanges, the nose is rather flatter than one would like. It is well to keep a bit of rubber tubing in each nostril for a time after the operation, as this affords support to the alæ and prevents undue contraction. It might be well, as a preliminary operation, to stiffen the last phalangeal joint of the finger in order to prevent a slight tendency to sagging of the

bridge of the nose, noticed in my first case. In other respects, the operation as above described has given entire satisfaction.

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TREATMENT OF THE POSTERIOR CAPSULE OF THE GLAND IN THYROIDECTOMY, BASED ON 375 OPERATIONS FOR GOITER[1]

BY C. H. MAYO, A.M., M.D., ROCHESTER, MINNESOTA

THE thyroid gland presents the most interesting of problems to the anatomist, physiologist, and surgeon. From an anatomical standpoint, the gland is intimately associated with most of the important structures of the neck. Anteriorly it is beneath the group of sternohyoid and thyroid muscles. It covers a considerable portion of the trachea, in front and laterally, is closely attached to this structure, as well as to the cricoid and thyroid cartilages.

What was known of the function of thyroid and associated ductless glands has been greatly advanced, in the last few years, by numerous contributions from physiologists and scientists; yet our present knowledge concerning them is undoubtedly still limited, although their importance in maintaining the metabolism of the body has been proven beyond question.

To the surgeon the thyroid and associated structures are of intense interest from an operative standpoint. While aseptic and antiseptic methods have removed one of the most serious of former risks of surgery, that of infection, we have in this local field so many other dangers and complications, which must be constantly guarded against, that the operation for goiter will always rank high in major surgery.

The thyroid gland is entirely enclosed by a fibrous capsule. Posteriorly this capsule divides into layers, one of which passes behind the esophagus to unite with that of the opposite side, while another layer does the same between the trachea and esophagus. The recurren, laryngeal nerve arising from the pneumogastrict passes up by the side of the trachea behind the gland, and next to the esophagus, to enter the cricothyroid membrane. On the right side this nerve is intimately associated with the inferior thyroid artery, passing either under or over it. On the left side it is somewhat more deeply situated, and less often associated with the artery. From the various layers of fascia which enclose all of these structures, and the intimate relation of the thyroid to the trachea, larynx, and esophagus, we can readily see the possibility of serious pressure effects, caused by a growth of the gland, or the development of tumors within its substance.

The common carotid artery and jugular veins may become greatly distorted and displaced by growths of the gland. Nerve trunks, such as the recurrent laryngeal and vagi, occasionally become paretic from continued pressure. Paresis of one or both recurrent laryngeal nerves, affecting the voice, may be one of the symptoms caused by the pressure of goiter; and all cases should be examined with the laryngeal mirror before the operation, to determine this point, as, if the paresis is on one side only, the sound vocal cord may possibly compensate by advancing across the midline. Otherwise in such conditions the paresis may be temporarily so increased, following operation, as to lead the operator to think that he has injured a nerve.

[1] Read before the American Surgical Association, May 7, 1907.

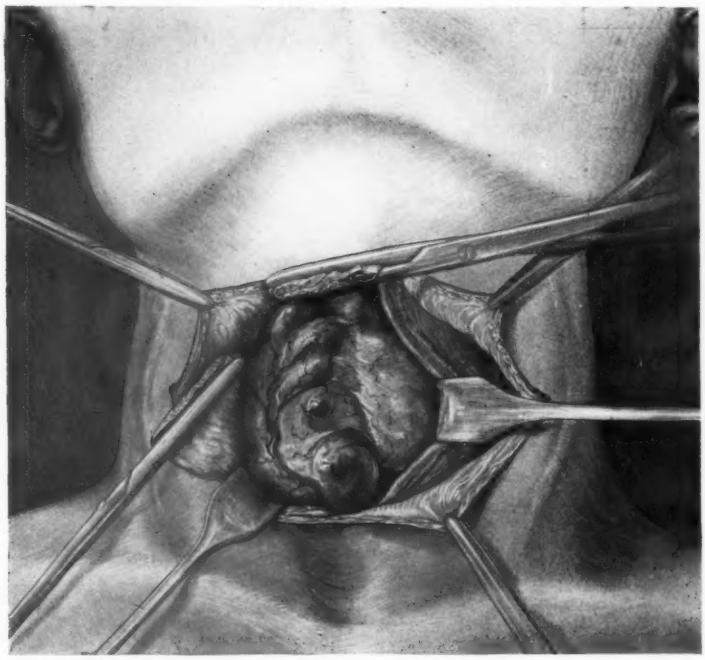

Fig. 1. Greatest exposure of the gland. High muscle section on one side.

The parathyroid bodies are four little gland-like structures, usually situated behind the thyroid gland, two on each side. The upper one is most commonly at the side of the larynx, close to the esophagus and superior thyroid artery. The lower one is located close to, or below the inferior thyroid artery. These glands may be displaced, increased, or decreased, in number; and while usually behind the intimate capsule of the gland, they may be enclosed with it in the capsule, in which case an ordinary extirpation would remove these glands with the thyroid.

Our present knowledge indicates that a most unfortunate complication, tetany, which occasionally follows removal of goiter, is caused by the loss of, or injury to the parathyroids. These bodies can usually be recognized, small pinkish or yellow fat in color, flattened ovoid bodies, ranging in size from minute structures to 1½ cm. in length.

All cases in which the thyroid glands are increased in size, whatever their pathology, are known as goiters. They may be classified in two varieties, diffuse and circumscribed. The diffuse variety usually retains the general confirmation of the normal gland with the right lobe somewhat larger. Such enlargement is often seen in hyperthyroidism, general colloid, and diffuse adenomata.

The circumscribed growths may be single or multiple nodules developing in one or more lobes. Incapsulated growths are frequently seen such as fetal rests, adenomata, and cysts, which have developed rounded tumors, having grown within the capsule of the gland proper, which may be destroyed or greatly injured by pressure atrophy.

Local anesthesia is only occasionally indicated in special respiratory difficulties, complicated by myocardial lesions. General anesthesia is preferred, and is aided by previously administering ¼ grain of morphia, and 1-100 grain of atropin, about 20 or 30 minutes before the patient is brought to the operating room. The patient is placed in the reverse Trendelen-

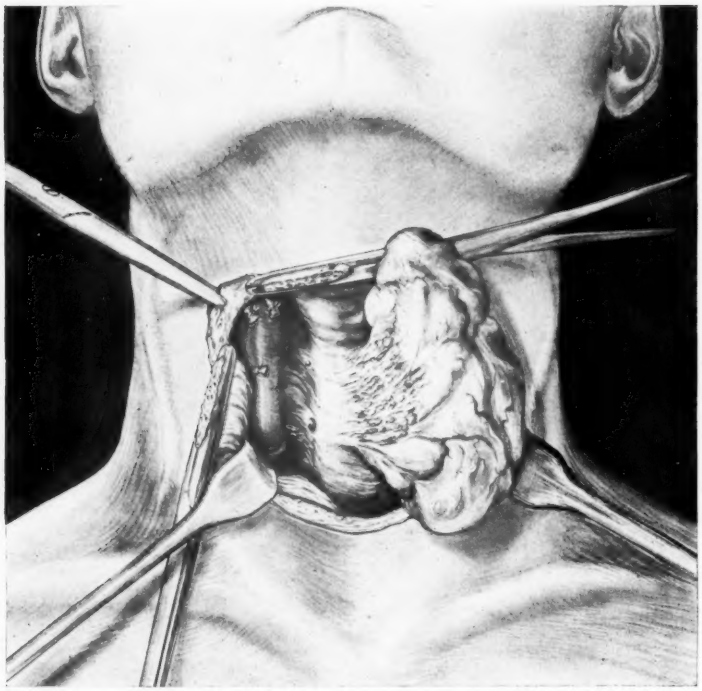

Fig. 2. Showing position of vessels and rotation of gland over and across trachea. Posterior capsule in the field of vessels

berg position, head up with shoulders elevated to expose the operative field. Ether is then administered by the open-drop method.

The Kocher transverse-collar incision gives good exposure with few disadvantages. The platysma myoides muscle is turned above and below with the skin. If muscle section of some of the sternohyoid and thyroid group is necessary, they are cut between forceps placed upon them near their upper insertion.

Those cases which present encapsulated tumors or cysts, are usually removed by perforation of the gland-substance and enucleation of the tumor, hemorrhage being controlled by upward lifting of the capsule and gland. The cavity left is closed and obliterated by a running locking suture of catgut. While myxedema might follow by this method, should all of the gland-substance be removed as well as the tumor, there will be no danger of injury to those important structures situated behind the capsule.

In diffuse adenomata, Mickulicz advocated a resection of large portions of the gland, often on both sides. This method also saves the posterior capsule. We have usually favored extirpation of one lobe in such cases and also in hyperthyroidism. The gland is elevated; all vessels entering and leaving the thyroid are double clamped, and cut between the forceps, as seen in the dissection, the most important ones being ligated at the time. The whole lobe is finally elevated with the fingers slipped behind it from the side. The capsule is opened along the side of the gland and brushed back with gauze into the wound, as the gland is lifted and rolled over toward the midline. All vessels are caught at once by forceps, taking care in applying them to grasp the tissues in line with the long axis of the body. In this manner the surgeon is less likely accidentally to include nerves which run in the same direction.

All small bodies of a gland-like appearance, seen about the thyroid, are carefully preserved;

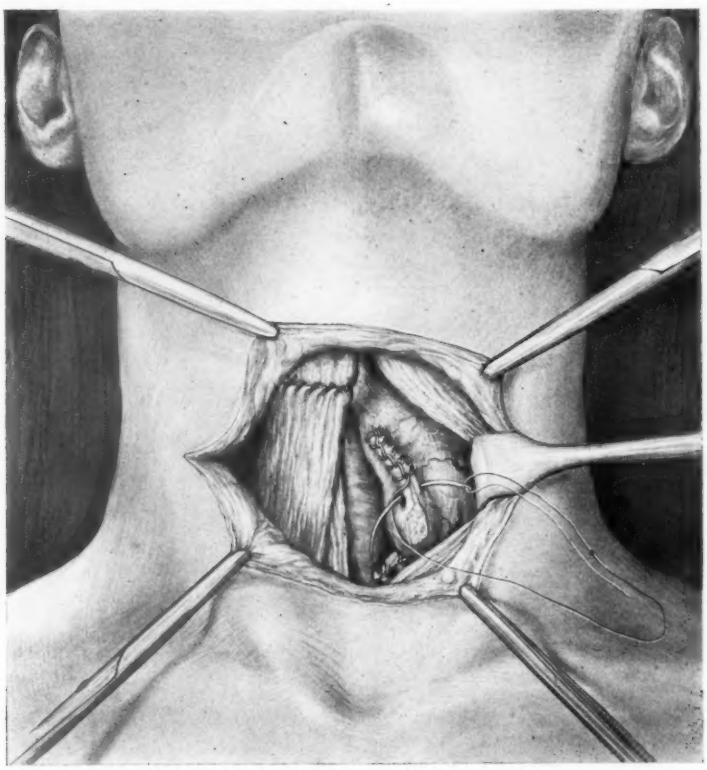

Fig. 3. Showing muscle suture near attachment and interlocking suture of cut gland.

especially is this done on the posterior surface, where there are a few glands other than parathyroids. The wound areas left from small growths are not drained. Drainage is instituted after the removal of large tumors, while all cases of hyperthyroidism are drained from 1 to 3 days, a separate incision being always provided for that purpose. A complication in the form of tracheal injury may occur during operation. Such an accident usually causes wound infection. The esophagus has also been opened in removing goiter, but if this complication is discovered, and the opening closed at once, it is not so serious according to cases reported, as that of unexpected perforation, occurring at a later period.

There is not much danger in this operation from air embolism, as the superficial veins are early clamped in dissection, or cut between ligatures. Should a vein be injured in the deeper dissection, there is usually sufficient free blood to cover any opening. One of the great dangers, however, is secondary hemorrhage, usually from the slipping of a ligature on the superior thyroid artery caused by including muscle. One can readily see that with a dilated artery, and a circulation much above normal in rapidity, that a most alarming hemorrhage may occur in a very brief period.

In our experience derived from over 375 operations for goiter, we have seen but one case develop tetany, and that only in the slightest degree. Some myxedema or other evidences of hyperthyroidism have been present in a few cases before operation, and in none has this condition been increased. In 5 cases we have increased the hoarseness, previously manifest, from the effects of pressure.

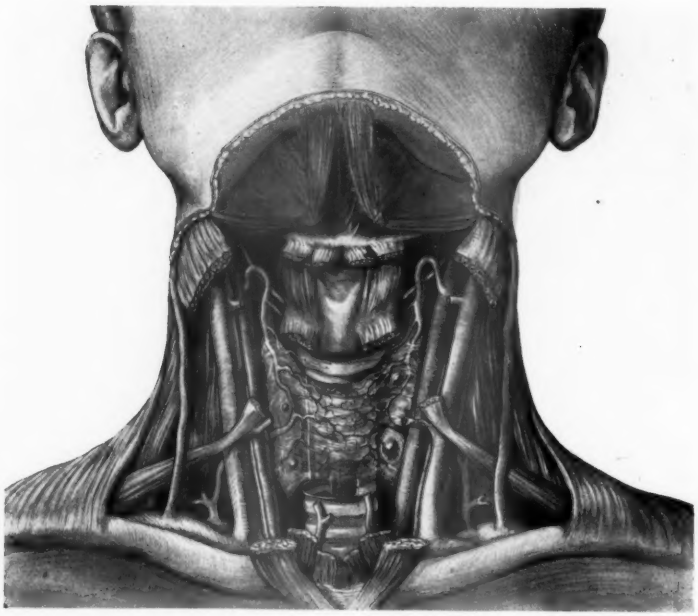

Fig. 4. Showing blood supply and anastomosis of vessels. Parathyroids behind capsule. Trachea sectioned showing recurrent laryngeal nerve.

From the practical experience gained from 375 operations and more, we believe tha tthe preservation of the posterior capsule of the thyroid gland, whatever be the method of its accomplishment, protects against many of the dangers of thyroidectomy.

REPORT OF A CASE OF NON-PARASITIC CYST OF THE SPLEEN[1]

By THOMAS W. HUNTINGTON, M. D., San Francisco, California

BECAUSE of its rarity, an unusual interest attaches to the following case. In a paper read before this Association in 1905, by Powers of Denver, 32 cases were tabulated. While these probably do not represent all reported cases up to that time, it is nevertheless a fact that non-parasitic cysts of the spleen have been encountered by the surgeon infrequently, and more rarely has a definite diagnosis been made prior to exploratory incision.

On January 12, of the present year, I was consulted by a woman aged 23 years and obtained the following history:

Family History. Parents both living and well. Otherwise family and personal history negative.

Past History. She was well up to the age of 21 years and led an active life. Aside from slight digestive disturbances has never consulted a physician until recently. Menstrual function normal. Was married 15 months previously and has never been pregnant. For a little less than one year previous to above date she had lived in Manila, where she enjoyed usual health escaping all diseases of a tropical character. Has never had typhoid fever. Two years ago she noticed a slight enlargement in the left upper abdominal quadrant. As it occasioned no pain or discomfort of any sort she attached no special significance to it; did not mention it to her relatives and it was not until after her marriage that special attention was attracted to it. In its early history it seemed to be a rounded, smooth, rather resistant mass about the size of a large orange. Careful inquiry failed to elicit any history of a traumatism.

Present Condition. The patient is a slightly built, rather delicate looking person, features somewhat drawn, suggesting the later stages of pregnancy. Present weight 106 pounds, which is for her the maximum. The skin rather tawny and apparently pigmented over irregular areas. On the whole seems fairly well-nourished.

Physician's Examination, 3 weeks prior to operation. On inspection the abdomen below the navel line appears normal, presenting no abnormal or unusual features. Between the costal cartilage and above the navel the abdominal wall is forced markedly forward, as if by a spherical mass which lies a little to the left of the median line. Percussion note over this area is absolutely flat. Dullness begins about 2 inches below the left nipple and extends to navel. Fluctuation was clearly manifest over the entire area. On manipulation the tumor seems slightly movable but maintains its position fairly well as above outlined. Over the convexity of the tumor mobility is more apparent than in its upper portion, suggesting anchorage of its superior surface. Transverse colon was made out with tolerable accuracy at the transverse navel line. Gastric resonance not identified. At no stage of the examination and manipulation was pain or tenderness elicited. Circulatory apparatus normal. Urine normal. Hemoglobin 85 per cent. Leucocytes normal. Red blood-cells, 4,300,000.

Through force of circumstances it seemed necessary to defer any operative undertaking for about 4 weeks. Accordingly final judgment as to the nature of the tumor was deferred, and the patient instructed to report at the end of 2 weeks.

Fourteen days later, on January 26, 1907, the following record was made:

The tumor mass, previously described, has increased perceptibly in size during the past 2 weeks. The increased size is manifest in more marked elevation of the anterior abdominal wall as well as in increased area of dullness. The tumor could easily be made out below the navel and entirely filled the space between the navel and the costal margins. The central point was still a little to the left of the median line. One week subsequent to this visit the patient reported that she had suddenly experienced severe pain and was prepared to enter the hospital at once. Examination on the following day showed that the tumor had increased enormously within the past week. The dullness now extended almost to the pubes and there were evidences of pressure upon the bladder. Bowel action which had previously been normal, had become irregular. The patient was anemic and looked greatly distressed. On standing or walking she experienced severe pain, and while in the prone position tenderness was noted over a large proportion of the abdominal area. The entire abdomen was markedly and regularly distended. Heart action was less satisfactory than during the earlier weeks of my knowledge of the case. At no time was there any rise of temperature. Patient had vomited several times within the past 2 days.

The patient had been originally referred to me by Dr. James H. Parkinson of Sacramento, California, with the suggestion that the tumor-mass consisted of a cyst either of splenic or pancreatic origin. My own opinion leaned strongly towards the probability of its being a pancreatic cyst, though I was fully aware that the early history of the case was more than suggestive of splenic involvement.

[1] Read before the American Surgical Association, May 7, 1907.

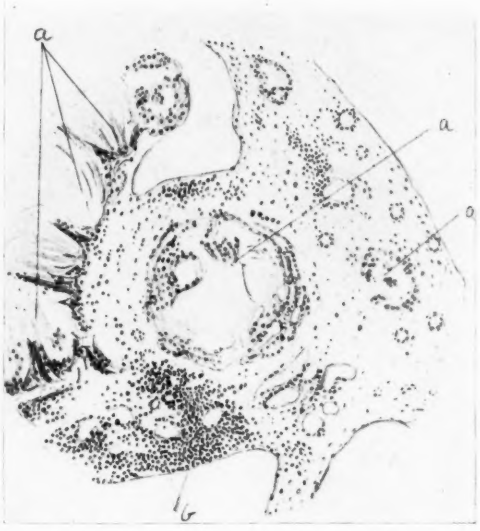

Fig. 1. *a*. Cysts lined with giant cells and containing homogeneous pink staining material, granular near wall. *b*. Collection of small round cells. High power.

On February 2, 1907, under gas-ether anesthesia, the abdomen was opened by a median-line incision from the ensiform cartilage to the navel. The cyst wall presented in the wound covered by a thin veil of omentum. After separating adhesions which were not extensive, and carefully protecting the abdominal cavity by gauze pads, through a large trochar, a little over 2 gallons of dark colored fluid was withdrawn. The cyst wall was then divided and its origin found to be definitely from the convex surface of the spleen. Prior to the evacuation, I had discovered that the spleen lay upon the upper segment of the cyst like an inverted clam shell, a free margin about 2 cm. in width being clearly made out. On delivery of the cyst wall it was discovered that the spleen itself was movable through a far greater range than normal. Numerous large venous sinuses passed from the spleen to be distributed widely over the cyst wall. At one point, the wall of the cyst was also adherent to the tail of the pancreas, by a loose fibrous attachment, but its relationship with that organ was by no means intimate. The operation was completed by excising the distal portion of the enormous cyst, puckering the cut margins with a purse-string suture, and finally marsupializing the remaining portion of the sac to secure external drainage. Abdominal wound was closed in the usual manner. The cyst wall was made up of fibrous tissue, very thin at the fundus, thicker at the cut edge. On the inner surface there were a number of small attached cysts which contained a clear serous fluid.

The subsequent history of the case was one of rapid and uninterrupted recovery. She left the hospital at the end of the third week still wearing a small drainage tube. At the end of 6 weeks the sac had completely collapsed and the wound was healed. Repeated examinations since that time have failed to reveal any disposition for a reaccumulation of fluid in the stump.

Patient's general health has improved markedly and she has attained within a few pounds of her normal weight.

Professor Ophüls reports on character of fluid, and structure of cyst wall, as follows: "Basing an opinion upon the character of the contents it must be regarded as originally of the serous-lymph variety with secondary hemorrhage in the sac." Professor Ophüls

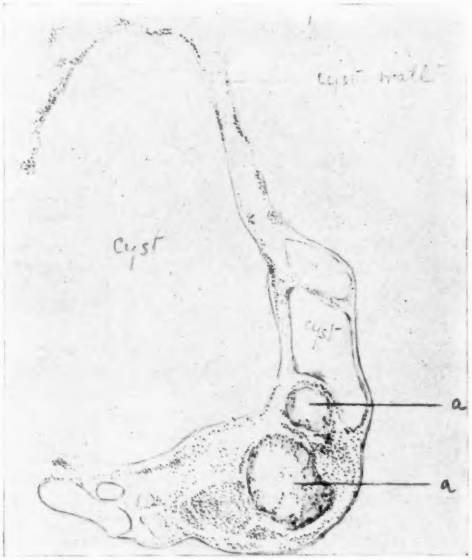

Fig. 2. Section of cystic lymphargioma. *a*. Cyst lined with giant cells. Low power.

further expressed the opinion that it was clearly not one of the so-called hemorrhagic cysts due to actual hemorrhage in the splenic tissue.

With our present knowledge of such cases as the foregoing, the choice of operation for radical relief lies between extirpation of the cyst, splenectomy, and marsupialization. Other methods mentioned by Powers such as simple puncture, incision, and drainage, may be considered obsolete for obvious reasons.

In dealing with this case I was influenced to attempt marsupialization because of the fact that the integrity of the spleen had not been noticeably compromised. Splenectomy would have been easy of accomplishment as the vessels were compactly grouped, and the mobility of the spleen would have given additional facility to such an undertaking. But despite the fact that Powers has collated a series of ten cases treated by splenectomy without a fatality, I chose marsupialization because of the promise of a more satisfactory result.

There can be no question that an organ of so great functional importance as the spleen, should be guarded jealously and removed only when its retention becomes a positive menace or its integrity destroyed. This position is emphasized by the following well-recognized facts to which attention is called by Moynihan. "Both experimentally and clinically it has been determined that following splenectomy there is a diminution in the amount of hemoglobin; a reduction in the number of red corpuscles; an increase in the total number of white corpuscles." These changes attain their maximum in about a fortnight and there is then a gradual return to the normal which is reached in about 4 months. Mental disturbance is occasionally noted and frequently there is a general enlargement of lymphatic glands. In animals absence of the spleen has been followed by marked changes in the bone marrow, loss of weight, weakness, thirst, polyuria, rapidity of pulse, and enlargement of the thyroid. Furthermore, experimental work points strongly to the probability that absence of the spleen renders the subject more liable to septic infection.

In dealing with a spleen which has been disorganized and nonfunctionating for a protracted period prior to operation, after-effects of splenectomy are less noticeable, owing to the fact that compensation has in a measure taken place during the preceding weeks, months, or years.

END-RESULTS IN OPERATION FOR CARCINOMA OF THE BREAST[1]

By ALBERT VANDER VEER, Albany, New York

WHEN I began the preparation of my paper, of which I present only an abstract to-day, it was my intention to include the histories of cases occurring in my practice during the past twenty-five years, but at this date I find it quite difficult to get so complete a list of end-results as I could wish; therefore, it has seemed better for me to continue this line of investigation for a longer period, and to give only a few of the conclusions regarding my impressions of the operation for carcinoma of the breast, as I have observed it since moving into our new hospital, from May 1, 1899, to May 1, 1906.

In this period there were 103 cases from which to draw conclusions regarding end-results. As to the relative proportion in the different decades they presented as follows:

20–30	1	50–60	32
30–40	15	60–70	16
40–50	35	70–80	4
Total			103

Family history negative in	53
Family history tubercular	25
Family history carcinomatous	18
Family history carcinomatous and tubercular	5
Family history not stated	2
Total	103

[1] Read before the American Surgical Association, May 7, 1907.

Left side	60
Right side	41
Both sides	2
Total	103
Deaths	17
Living, known to be	70
Not heard from	16
Total	103

Later I hope to give statistics of all of my work in this field of surgery, and in such a manner that more careful and intelligent conclusions, regarding end-results, may be reached. Time will not permit of my speaking of any great number of cases referred to in the remarks which this abstract brings out. I may be permitted to observe, in reference to the operation for carcinoma of the breast — as I think of it when I began practice over forty years ago, and now — that it is but another illustration of the impressive manner in which surgery has advanced. The operation has become more and more scientific, more and more thorough, as our knowledge of pathology has increased; and especially would I emphasize the comfort we have at the present time, in hospital work, in being associated with a laboratory where competent examination of specimens, and original research and investigation, can be made.

Forty years ago, and for many years after, there were few surgeons who entered the axillary region and did a complete removal of its contents. There were too many surgeons who comforted themselves with the belief that this axillary involvement was simply inflammatory, and when once the diseased breast was removed these conditions would improve and disappear. I may be pardoned for referring to this feature of the subject under discussion, for I have watched with so much interest the gradual advances until, at last, we have so thorough a removal as that which many of us do, and in many cases, just emphasized and referred to in so scientific a manner by Dr. Halstead. While it will be noted that in cases of apparently non-involvement of the axillary glands, based upon careful observation, palpation, etc., at the time of the operation, for years it has been my rule, in keeping with my method of operating, to empty the axilla of its lymphatics and contents. Step by step has it been my privilege to increase the thoroughness of the operation so that I am sure if I were to classify my cases in periods of a half decade each it would show a marked improvement in the end-results and permanent recoveries.

Regarding the diagnosis, I should like to emphasize most earnestly the importance and wisdom of our impressing upon the profession at large, more thorough work in this direction; that they must not yield to the wishes of the patient that she may not know of any serious trouble which presents, nor comfort her with the thought that there is but a simple mastitis to deal with; but that they must call in consultation the surgeon in whom they have confidence, and then together — the physician and surgeon — they can study the case, employing such excellent methods as have been suggested by Dr. Warren and others, and thus reach as nearly a positive diagnosis as possible. If the case be non-malignant in character let the patient have the benefit of the exhilerating effect, by lifting her out of the atmosphere of fear of cancer, which she may have entertained, into the buoyancy of thought that tells her she has had a careful, thorough examination, and can believe the statements made to her as the result of the consultation. If, however, the concensus of opinion is in the direction of malignancy then she should know it, or, at least, her friends should; and I wish to emphasize here, as my own experience, and as that of many candid surgeons and careful pathologists, that when once this diagnosis has been made, or there is a suspicion of malignancy, the earlier the operation is done, and the more thorough and complete it is, the better for our patient — and for our statistics — as to complete relief.

To know that her tumor has been thoroughly removed, to realize that she has made a good recovery, and to be assured that the chances are altogether in her favor, is a prognosis of no mean importance to any patient, whether intelligent or ever so ignorant. It is something she can forget when there is only a painless scar to be observed, which disappears gradually; but, to have present a tumor that is ever in her mind is a depressing factor that cannot be overlooked. If there is anything in suggestion upon the nervous system, in these cases, there is no one thing in which it is possible to do so much

good as to impress upon the patient that she is well, and that she is to forget her past fears. All her surroundings are to be made such as will eliminate the fear of a recurrence, and return to her former atmosphere of despondency.

I have thought much as to the incision, when once the operation is determined upon, and it seems to me that the one which begins well up in the axilla, almost on an oblique line to a point below the nipple, thence along the under surface of the breast to the median line, with a corresponding eliptical incision above, which traverses the upper segment of the breast area, joining with the incision just underneath the outer edge of the pectoralis major, has enabled me to reach the breast and the lymphatic spaces quite satisfactorily, even to the removal of the pectoral muscles. This is an incision that affords good drainage, and will not be greatly observed by the patient when all is well and recovery has taken place. I am full of faith in the belief that plastic work, for covering the area from which we have removed a large amount of diseased tissue, is thoroughly serviceable; and I am impressed with the small percentage of return in the scar, in the fatal cases metastases to internal organs being the principal factors causing death.

The benefit of careful laboratory examination, as to the correctness of diagnosis, in the table this paper presents, is instructive, comforting, and tends decidedly to the endorsement of the value that can be placed upon the work of our pathologist.

I quote the following:

CASE 1. Mrs. E. S., aged 46 years. Operation May 28, 1902. Fourteen years ago noticed a bunch in left breast, at the time she was nursing a child. This remained stationary until 3 months ago when it enlarged rapidly and was very painful. Growth at first had the appearance of a carcinomatous tumor, and an incision to aid diagnosis was made. The pathologist, from the macroscopic appearance, and hurried examination made at the time, was in doubt. Thorough removal was done, and pathologic report from the laboratory later classed the tumor as an adenoma with lymphangitis.

It seems to me that there is no greater field for the philanthropist than the endowment of pathologic laboratories for just such work as this. I am satisfied that there are degrees of malignancy, and that there are associations of one form of malignancy with another that can only be worked out in this manner.

The end-results in the 103 cases spoken of in this table bring out a few points of interest.

Of the hopeless or unfavorable cases, where only temporary relief can be afforded, I am satisfied that many are benefitted by an operation, it being well understood at the time, by the patient and her friends, that it is only to relieve her from suffering, and from the distress to which her associates may be subjected in coming in contact with an ulcer that is likely to be so exceedingly offensive and difficult to keep in an antiseptic condition. My experience impresses me with the belief that, although such operations bring little, if any, credit to the surgeon, they do relieve the patient of much physical and mental distress.

I can say very little permanent good has resulted from the use of the X-ray, except the relief from pain it affords. I can endorse the comfort patients have received from this line of treatment, and must say that I have seen cases in which life seemed to have been prolonged, but then there is always the element of chronic carcinoma to be considered when we say that this or that patient's life has been lengthened by such treatment.

When I consider the treatment of tumors of the breast to-day, especially carcinomas, as compared with that of forty-five years ago, I must endorse the emphatic language in which the layman expresses himself when he says, "What wonderful progress surgery has made!" Yet, at the same time, how far short we have come of that success so much desired, and how selfish for us to appropriate such an expression when we carefully review the great progress that has been made in medicine, in the knowledge of cholera, typhoid fever, and other diseases.

I fancy that if such men as Parker, March, the elder Gross, the senior Warren, and others, could look in upon an operating-room to-day, when an operation was being done for removal of carcinoma of the breast, there would be a look of interest and of surprise not unlike that to be noted in their expression could they see the advances made in abdominal surgery at the present time.

Referring to the methods of operation and

period of time after the discovery of the tumor, I would say that in the cases that are reached early I am not yet convinced that the very radical operation of removal of the pectoral muscles is called for, but we cannot be too emphatic in impressing upon the younger men the necessity of careful examination and dissection of the axillary spaces.

In this report will be noted a few cases where tumor was noticed early in the breast, which did not worry the patient, yet later developed carcinoma.

CASE 2. I believe this was the case with Mrs. H. B., aged 43 years, who gave a negative family history, aside from maternal aunts who had died from tuberculosis. Patient always well in every respect, with the exception of psoriasis since 12 years of age. Twenty-three years ago first noticed small, hard tumor in right breast, above nipple. No known traumatism. Size increased slowly up to two years ago; some pain, but never severe. Tumor, size of a hen's egg 2 years ago, then increased rapidly and painful. Six months later began to have pain under arm, and noticed small lump there. Patient in good physical condition. Examination at hospital showed large, hard mass in upper half of right breast, one large, and several small nodes in axilla, and in left axilla is one large indurated gland. Operation February 26, 1901. Amputation right breast, removal of axillary glands, with pectoralis major and minor muscles, and left axillary space thoroughly dissected out. Patient left hospital in good condition and has remained well.

These cases are most suggestive. They are the ones in which we cannot but feel that had the original simple adenoma been looked after in a judicious manner, the patient might later have escaped the carcinomatous element.

It is remarkable how unconcerned some patients are in reference to growths about the mammary gland, while others, with the very slightest evidence of some disturbance become greatly alarmed, their nervous system receiving a shock that is sad to observe and detrimental to them when the operating-room atmosphere is reached. The latter class of patients are often unwilling, even amidst their fears, to have surgical intervention, yet they are, of all cases, the most in need and a class we should endeavor to reach early.

The condition of the no-worry patient is in great contrast to the nervous anxiety of the one who is frightened over the thought that she is to suffer from cancer of the breast, at some time, and the years in which this period of worry may be unnecessary, yet where ultimately a tumor does present.

CASE 3. Mrs. E. M., aged 57 years. In its end-results this case has been a most instructive one. In the total series of cases I began to elaborate I was greatly impressed with what I had sometimes been led to call the precancerous state, from the nervous condition of the patient. Mrs. M., for nearly a year previous to the discovery of the tumor, came to my office not infrequently, and while not suffering from direct, characteristic, lancinating pain, or anything clinically that would demonstrate a growth presenting, yet was possessed of the fear that she was to have "a cancer of the breast." She gave a good family history and was apparently well otherwise. She would, at times, locate an unpleasant feeling in the right side, and in order to relieve her from too many self-examinations I advised her to wear a diachylon plaster quite continuously, but she did not forget her condition. In November, 1901, she discovered a small lump in the right breast. I advised a thorough operation, which was done December 14, 1901, and specimen removed proved to be one of scirrhous carcinoma, with metastases to axillary glands, although the latter could scarcely be felt, on palpation, previous to the operation. The wound healed kindly and remained in good condition, but the patient was not relieved of her nervous strain. She was frightened and in constant fear. About May 1, 1902, she was sure that a tumor was developing in her left breast, and May 14, to my own distress, I could distinctly map out a small growth. The patient's mental condition was truly pitiable, but with a resignation that was heroic she submitted to a second operation, May 25. In this second operation the pectoral muscles were removed, also the axillary glands; thoroughly, however, the microscope alone could detect any invasion of them. From this operation she recovered, but later had pains and some enlargement of the cervical glands and submitted for some time to X-ray treatment, getting relief from the pain, and at one time felt very much encouraged. There were no ulcerative growths in the scar tissue. She seemed fairly resigned to the fate that was inevitable, and while there were no metastases to the internal organs, or, apparently, to the lung, yet this patient was taken suddenly ill and died, in a comatose condition, January 13, 1904, from all the evidence of carcinoma of the brain or membranes.

I would call especial attention to the return of the disease, in some instances very late after the first operation. This series of cases give some interesting facts as to the time of recurrence.

CASE 4. Mrs. S. A. W., aged 56 years, upon whom I operated for removal of the right breast and axillary glands in 1887, remained absolutely well until July, 1899, when she noticed a small tumor in the scar, which gradually increased in size and became painful. She presented for operation January 17, 1900, when I did a second operation and patient has remained well since.

CASE 5. This is an inoperable case. Mrs. J. M., aged 56 years, upon whom I had operated 7 years previously for carcinoma of the right breast, returned July 3, 1899, for treatment. Patient had remained well up to within a short time when the growth appeared, now presenting large nodules involving the axillary region to a marked degree, and cachexia very pronounced. Case not in a safe condition for further operative intervention. Axillary region contained a large, gangrenous, sloughing ulcer.

The shortest period of recurrence is as follows:

CASE 6. Mrs. L. C., aged 50 years, gave the history of observing a tumor in right breast for two years, then applied for treatment, and operation done March, 1901. She was well for about three months when secondary growths appeared in scar tissue. First growth not at all painful, second gave great pain. Second operation done May 1, 1901, for removal of the growths in the axilla and surrounding tissue. Very thorough removal done at this time. Patient at this operation was very much emaciated and had a growth in the axilla about half the size of a hen's egg. She made a good recovery from this last operation and when last heard from was in good health. Laboratory report as follows: Recurrent carcinoma of mammary region.

CASE 7. Mrs. A. E. H., aged 51 years. Amputation of right breast August, 1903. Growth returned March, 1904. I did a second operation May, 1904, removing all scar tissue, together with subclavicular and axillary glands. Patient made a good recovery and so far as I am able to state has remained well since.

Regarding the element of pain it is not always so pronounced or marked until the tumor takes on an active stage of increase.

CASE 8. Mrs. E. H., aged 65 years. History of cancer on paternal side. Patient always well. Menopause two years ago. Five years ago noticed small, movable bunch in upper portion of left breast. No pain or soreness except a little towards axilla. Increase very gradual until past six months, since which time growth has changed position to around the nipple, which is retracted. Operation May 24, 1904. Tumor, with axillary glands, entirely removed. Pathologic report confirmed diagnosis. Good recovery followed.

Careful study of this question impresses one with the knowledge that when an operation is done before involvement of the axillary region a better percentage of recoveries follows.

CASE 9. Miss L. K., aged 59 years. In 1900 was operated upon by a surgeon who did not think it necessary to remove the axillary glands. In October, 1901, a tumor presented in the axilla and scar tissue. January, 1902, she first consulted me, at which time growth in axilla and scar were considered inoperable, and X-ray treatment employed with benefit in relieving pain and reducing tumor in size, but did not result in permanent relief.

In the table of operations there are two cases of metastasis to the long bones.

CASE 10. Mrs. M. C., aged 57, a large woman, well-developed with much adipose tissue. General health not affected and patient much opposed to operation with knife. Trouble began January, 1901, when growth in right breast first noticed, which gradually increased, but no marked pain. Patient took various treatments, including X-ray and injections hypodermatically. June 17, 1902, she presented with a large tumor involving the right breast, with axillary glands enlarged and causing her much distress from pressure of the arm upon them against the chest. I did a very thorough operation, removing the pectoral muscle, the subclavian glands, and to close wound brought up flaps from the side and surface of the abdomen. Patient made a good recovery and left the hospital in excellent condition. Laboratory report on specimen as follows: Scirrhous carcinoma, with metastases to lymphatic glands. This patient continued in good health, with the exception, at times, of complaining of pain in region of, and underneath scapula, and of some swelling of right arm. This disappeared in time, she was able to attend to her household duties and remained well until the summer of 1905, when she showed more marked cachexia, but no appearance of metastases could be discovered. The original scar was in excellent condition. About the first of August, in getting up from bed one morning, she suddenly collapsed and upon being taken up and placed in a chair it was found she was unable to use her left leg. She was brought to the hospital, and examination revealed a fracture of the upper third of left femur with the evidence of carcinoma being present. She also complained of pain in her left chest and on examination there was found quite a pleuritic effusion. Patient was placed in bed, the limb properly dressed, bowels and kidneys carefully watched, and for four weeks she improved, but finally died from all the evidence of carcinoma of the pleura, possibly of the lung, on the left side.

I have been greatly impressed in the cases in this table that have come to me, in which there was a well-defined carcinoma of the breast and also fibroid tumors of the uterus. In these cases I have operated for both conditions, cases generally doing well, but there is a greater degree of anxiety to the surgeon. Again, in others, I have only removed the breast, and these patients seem to live on very comfortably for many years, with no apparent disturbance from the uterine fibroid. Patients who have passed the menopause do best.

The element of traumatism in carcinoma of the breast has ever commanded my careful

thought. Is it a factor? We must heed the history of such cases as the following:

CASE 11. Miss D. P., aged 42 years, who gave a very unusual history. In October, 1902, she presented with a history of a gradually developing tumor, which followed traumatism of right breast. Patient had struck against a chair in January, 1902, and hurt herself. May, 1902, she noticed marked pain over the region of original injury. Tumor now about the size of an orange, painful, movable, and with axillary involvement. Operation done, axillary space thoroughly cleaned out, and patient made a good recovery. At this time we also removed a uterine polypus, which laboratory reported non-malignant in character. Growth removed from breast was reported carcinoma, with papillomatous changes of nipple and metastasis to axillary lymph nodes. She made a good recovery, gained in flesh and in every way felt herself thoroughly well until February, 1906, when she was not so well, having a marked pain in left side. She presented for examination February 21, 1906, when a diagnosis of pleurisy with effusion was made, chest was aspirated and three pints of serous fluid were removed. At this examination her family physician, Dr. Larkin, discovered a hard mass associated with the left breast, which the patient said she knew very little about. Nipple was retracted, mass movable, very hard, scirrhous in character, and axillary glands also involved. Following further effusion a second aspiration was done and about 16 ounces of fluid removed. Patient recovered, and was so encouraged, and expressed such a strong desire for removal of the breast, that an operation was done June 2, 1906. She made a steady, uninterrupted recovery from all of her ills and in every way it was a successful case. She returned home, but later had further attacks of pleurisy and died, evidently, from metastasis of the pleura, about six months after the second operation.

This case illustrates the cancerous diathesis most earnestly.

It is a matter of interest, in our patients who are exceedingly fleshy, to note the difficulty that sometimes exists in reaching an early diagnosis, but I have an impression that these patients are very susceptible to the least disturbance about the glands and a pain, be it ever so slight, attracts their attention at once. A clinical diagnosis is not always so easy.

CASE 12. Bears upon this point. Mrs. S. C., aged 34 years. Family history strongly cancerous, several members having died from this trouble, including her mother, and this history was a source of great anxiety to her. July, 1902, first noticed lancinating, characteristic pain in right breast, and six weeks ago noticed a tumor. Axillary glands involved. Prompt operation was done, January 25, 1903, believing, from the clinical history, that this patient was suffering from acute carcinoma of the breast. She weighed 200 pounds. Thorough removal was done and report from the laboratory showed growth to be a cystic fibroma of breast with lympho-adenitis.

It is very instructive to note how short a time sometimes elapses in the period that a tumor is apparently developing.

CASE 13. Mrs. E. M., aged 65 years, three months previously had slight pain in left breast. Now there is a tumor size of a pigeon's egg, which has grown rapidly. Not much loss of weight or strength. When patient presented for examination and treatment growth was ulcerated, rectangular in shape, and measured 17 x 12 cm., seemed movable, with a very offensive odor, and glands of axilla involved. Thorough operation was done November 12, 1902, and patient made a good recovery. Pathologic report from laboratory: Very cellular, medullary carcinoma.

The following case giving a tubercular history is impressive:

CASE 14. Mrs. A. L. W., aged 37 years. This case arouses the sympathy of the surgeon. She gave a family history of most pronounced tubercular trouble, and had had some early lung affection herself. In the beginning of 1903 she discovered a small growth in her right breast, which alarmed her, but of which she said very little to her family. At first it developed very slowly but later, with slight, characteristic, lancinating pain, it began to grow more rapidly. She lost in appetite and weight and presented the appearance of a patient much worried about herself. When she came to my office, December 29, 1903, I told her husband and herself that she undoubtedly had cancer of the breast and that an immediate operation was advisable. To this they readily consented, although they had been advised differently. The operation, December 31, 1903, was a most serious one, involving about three inches of the axillary vein, which I was obliged to dissect out and ultimately ligate the axillary artery, resecting a portion of it with the tumor. The nerve supply was preserved. The collateral circulation was sufficient to maintain life, and no gangrenous spots appeared, yet great coldness of the arm in the healing of wound. No radial artery could be made out after her recovery, although she got the use of her hand and forearm very well. The wound remained in good condition for about eight months when a slight nodule appeared in the upper portion of the scar. She now returned to the hospital and had a most complete, thorough application of the X-rays, with a disappearance of the nodule, the suffering and indurated tissue, and the swelling of the arm, so that the patient really felt very much better; however, the same conditions returned in other portions of the cicatrix and a second operation was done October 28, 1904, for removal of the secondary deposits, a plastic operation performed, and patient made a very good recovery. On April 15, 1907, her husband wrote me that the case had not changed materially although she was gradually growing weaker. The great complaint was the immense swelling of the right arm, which gave her a good deal of pain.

THE RESULTS OF OPERATIONS FOR CANCER OF THE BREAST AT THE MASSACHUSETTS GENERAL HOSPITAL FROM 1894 TO 1904[1]

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AT the request of Dr. R. G. LeConte, the Secretary of the American Surgical Association, and of Dr. J. Collins Warren, and with the assent and approval of the surgeons of the hospital, the writers have attempted to trace and to report the cases of cancer of the breast which entered the Massachusetts General Hospital during the 10-year period from January 1, 1894, to January 1, 1904. The latter date was selected in order that a period of at least 3 years should have elapsed after operation in every case. It is with great pleasure that the writers acknowledge their appreciation of the cordial co-operation they have received from all of the members of the hospital staff, and especially from the administrative officers of the hospital who have contributed much to the success of this rather arduous undertaking.

The Massachusetts General Hospital may be taken as a type of the larger American general hospitals where operations are performed by a considerable number of surgeons, each one being on service for only a small portion of the year; in contrast to the special or university hospitals, where one surgeon is continuously on duty for many years, and specialization in the different branches of surgery is a possibility. It is to be supposed that the statistics of the general hospitals can never equal those of the special hospital; but it is fair to say that they do represent more accurately the average results of surgery in a given community, and thus give perhaps a more correct indication, from the patient's point of view, of the average expectation of cure. The 416 operations of this series were performed by 20 different surgeons,[2] and the greatest number performed by any one surgeon was 51.

The methods employed in tracing cases were those which have proved efficient in other investigations. The hospital record of each case was first abstracted on a card of convenient size. (Fig. 1.) These cards were numbered consecutively, and re-entries, out-patient records, and letters from patients, were attached. A letter was then sent to each patient, or to her friends. When no reply was received from patients or friends, letters were sent to attending physicians, postmasters, police departments, city and town clerks, and boards of health. Many of the fatal cases were found in the exellent records maintained by the Massachusetts State Board of Health, and a few from the bureaus of vital statistics of other New England states. Finally, a certain number of cases were traced by personal interviews with neighbors, relatives, and friends; by reference to city directories; and by the use of registered letters. Three hundred and seventy-eight of the total 416, or over 90 per cent of the cases, were followed to a definite end-result, and the writers feel compelled to acknowledge that without the courtesy and co-operation of many persons, whose interests were in no way involved, this report could not have been prepared.

In making a study of hospital records which have been written by different house officers of varying degress of ability and accuracy, it is essential that a uniform interpretation be placed upon the data thus obtained.

The record of the operation performed in

[2]Drs. C. B. Porter, J. C. Warren, John Homans, H. H. A. Beach, A. T. Cabot, J. W. Elliot, M. H. Richardson, F. B. Harrington, S. J. Mixter, W. M. Conant, C. L. Scudder, J. G. Mumford, W. A. Brooks, Jr., C. A. Porter, F. G. Balch, G. W. W. Brewster, Farrar Cobb, E. A. Codman, R. B. Greenough, and D. F. Jones.

[1] Read by invitation at a meeting of the American Surgical Association, May 7, 1907.

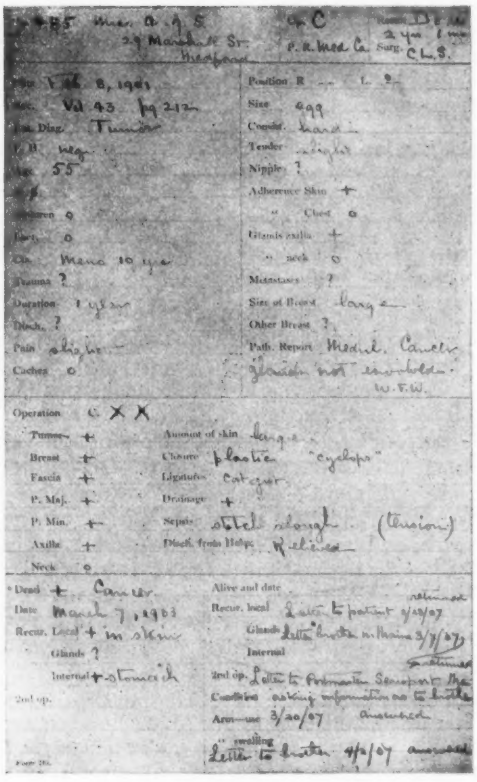

Fig. 1.

each case was studied, and the operation was classed in one of the 4 following groups:

1. *Complete Operations*, in which the tumor, the breast, the sternal portion of the pectoralis major muscle, and the entire axillary contents were removed; and the pectoralis minor muscle, either divided or removed. Exploration *above* the clavical was not considered essential. This interpretation of the essentials of a "complete" or "completed" operation was accepted as the opinion of a majority of the visiting surgeons of the hospital.

2. *Semi-complete Operations.* Those in which the whole of the complete operation was done, with the exception of the division or removal of the pectoralis minor.

3. *Incomplete Operations.* Those in which an attempt at radical cure of the disease was made, but the pectoralis major, a portion of the breast or of the axillary contents, or other parts essential to the complete operation, were left behind.

4. *Palliative Operations.* Those in which no hope of radical removal of the whole disease was entertained, and cancerous tissue was supposed to remain in the wound at the end of the operation.

It has been the custom of the hospital since 1885, for all material obtained at operations to be examined by a clinical pathologist, Dr. W. F. Whitney. The pathologist's report is filed by the house officer, and bound up with the patient's clinical report; but reports are sometimes lost. Of the 376 cases which form the basis of this report, in 39 no pathologic report was found. In 337 cases the report of the gross and microscopic examination of the tumor, and usually of the axillary and supraclavicular glands, when removed, was present. It is probable that pathologic examination of every case was made.

In the interpretation of causes of death, and their relation to possible recurrence, the writers have endeavored to err on the side of safety, and to accept no case as dying free from recurrence, which was not above reproach. For this reason 28 cases dying of "apoplexy," "paralysis," "multiple neuritis," "pleurisy," "pneumonia," "inanition," "gastroenteritis," etc., have been arbitrarily assigned to the "died with recurrence" class. The 7 cases which have been admitted to the "died without recurrence" group, will be discussed in detail in another place. Two patients that died within three years of operation, of diseases other than cancer, have been thrown out entirely as giving no data of value in determining the success of operation. In this way a uniform interpretation of results was obtained, which, it is to be hoped, may be employed in the publication of statistics of other series of cases.

The information with regard to the 64 cases, here reported as alive and well, was obtained from the following sources: Letters from the patient were accepted as evidence in 38 cases where the patient lived too far away to come to the hospital for examination; letters from acquaintances and relatives were received in 5 cases; letters from physicians were received

in 8 cases; and 13 patients came to the hospital for examination.

During the 10 years from January 1, 1894, to January 1, 1904, 613 cases of breast cancer were entered on the records of the Massachusetts General Hospital. Of this number 416 were cases of primary operation; 80 were re-entries of the above 416; 52 cases were discharged untreated, by or against the advice of the surgeon; 45 were patients first operated upon elsewhere and admitted for recurrence; and 20 were cases operated upon in the Massachusetts General Hospital before 1894, and re-admitted with recurrence.

TABLE I

1894–1903 Inclusive

Primary operations	416
Re-entries	80
Untreated	52
Recurrence from operation elsewhere	45
Recurrence from operation before 1894	20
Total cases	613

Of the 416 cases of primary operation, 376 were traced to a conclusive end-result, 38 could not be traced, and in 2 cases the results were inconclusive.

These 376 end-results have been divided into 5 groups as follows:

TABLE II

YEAR	Alive and well	Alive with recur.	Died of oper.	Died without recur.	Died with recur.	Total for year	Total Free of recur.
1894	3	0	0	2	27	32	5
1895	2	1	0	0	41	44	2
1896	10	1	7	1	32	51	11
1897	5	0	1	1	25	32	6
1898	4	0	3	0	27	34	4
Total for 5 years: 1894-'98 inclusive	24	2	11	4	152	193	28
1899	7	3	0	0	28	38	7
1900	7	0	2	1	28	38	8
1901	4	2	0	2	32	40	6
1902	10	1	1	0	28	40	10
1903	12	0	1	0	14	27	12
Total for 5 years: 1899-'03 inclusive	40	6	4	3	130	183	43
Total 10 years: 1894-'03 inclusive	64	8	15	7	282	376	71

The percentage free from recurrence, including palliative cases and deaths from operation, was in the 5 years from 1894 to 1898 inclusive, 14.5 per cent, or, omitting palliative operations, 16 per cent. For the second 5-year period it was 23.5 per cent, or, omitting palliative operations, 26 per cent. For the whole 10 years, 1894 to 1906 inclusive, it was 18.8 per cent or, omitting palliative operations, 20 per cent.

The 64 cases reported alive and well have all passed the 3-year period without evidence of either local recurrence or interanl metastasis, with the single exception of 1 case. This case had a recurrence in the axillary portion of the scar, 2 years after the primary operation; the recurrent nodule was removed 4 years and 8 months ago, and has not retunred. The duration of life of these 64 cases is as follows:

TABLE III

Duration of Life in 64 Cases Alive and Well

3–4 years	9 cases	9–10 years	4 cases
4–5 years	13 cases	10–11 years	8 cases
5–6 years	5 cases	11–12 years	6 cases
6–7 years	6 cases	12–13 years	2 cases
7–8 years	7 cases	13–14 years	1 case
8–9 years	3 cases		
Total	43 cases	Total	21 cases

Average of 64 cases, 6 years and 10 months.

The oldest patient in this group was 76, the youngest 29 years of age. The consideration of the prognostic importance of the age of the patient, the duration of the disease, and its situation in the breast, will be taken up in connection with the data obtained from the study of all 5 groups.

Disability. It has been most gratifying to observe how little disability was produced, even by the most complete operations when both of the pectoral muscles were removed. Reports upon this point were given in 53 of the 64 cases. Twenty-six had "full" or "perfect" use of the arm; 20, had good use; 4, "fair;" 2, only "a little;" and in 1 case, in which sepsis and erysipelas occurred after operation, the arm was described as "stiff." It has been our experience that the functional impairment of the shoulder, which may be pronounced immediately after operation, disappears during the first and second year, and rarely causes any difficulty after that time. With regard to swelling of the hand and arm, as a result of the dissection of the axillary lymphatics and obstruction to the axillary veins, the results were

found to be less satisfactory. In 48 cases, information upon this point was available, and in 17 of these cases swelling of the hand or arm was spoken of. It is probable that swelling of the upper arm is to be regarded as the direct result of the removal of the axillary lymphatic trunks; but swelling of the hand and fingers may probably be attributed to cicatricial pressure upon the vein. It is reassuring, however, to find that swelling of the arm occurs so commonly in cases without recurrence; and that it is not to be regarded necessarily as evidence of axillary recurrence.

Alive with Recurrence. Eight cases, 6 of which have recurrent nodules in the scar, 1 in the spine, and 1 in the ribs. The length of life after the original operation in these cases is as follows:

TABLE IV

3–4 years	1 case
4–5 years	1 case
6–7 years	2 cases
7–8 years	2 cases
10–11 years	2 cases

One of the patients operated upon 11 years ago, for colloid cancer, had recurrence immediately after operation, which has slowly increased in size up to the present time, but has not yet been operated upon, causes no disability and has shown no evidence of generalization — a relatively non-malignant cancer. Two of the alive-with-recurrence cases are examples of so-called "late" recurrence, one being a case of adeno-carcinoma — free from recurrence for 7 years, and then developing symptoms of spinal recurrence — the other, a case of medullary cancer, examined and found free from recurrence 6 years and 9 months after operation, but developing a recurrence in the scar before the next report 6 months later.

Seven cases died without signs of local or internal recurrence, at a period more than 3 years after operation. These cases were as follows:

Two died of "debility and old age," at 71 and 74 years of age — 9 years, and 7 years and 8 months, respectively, after operation. Two died of "consumption" — $4\frac{1}{2}$ and $5\frac{1}{2}$ years after operation. One case died of apoplexy — 6 years after operation. This case was not classed as an example of cerebral metastasis, as the patient was 78 years of age and had had already one attack of cerebral hemorrhage with almost complete recovery, 3 years before. One patient died of acute renal disease — 4 years and 3 months after operation — and was reported by her physician as free from local or internal recurrence; and the last of the 7 cases died of acute lobar pneumonia in the hospital — 4 years and 4 months after operation — and a complete autopsy revealed no evidence of carcinoma.

TABLE V

Twenty-eight cases dead with probable recurrence

	No. of cases	Duration after operation	
		Years	Months
Arteriosclerosis	1	1	11
Paralysis and apoplexy	7	0	9
		1	5
		2	5
		3	0
		3	2
		7	7
		11	0
Meningitis	1	1	2
Brain tumor	1	0	9
Heart and kidney disease	1	3	7
Cardiac hypertrophy	1	0	5
Cardiac insufficiency	1	0	6
Mitral stenosis	1	2	3
Pneumonia	4	3	2
		0	3
		0	7
		0	3
Consumption	2	2	7
		1	3
Bronchitis	1	0	7
Pleurisy	1	3	4
Gastro-enteritis	1	1	3
Dysentery	1	1	5
Cancer of uterus	1	2	1
Multiple neuritis	1	0	10
Erysipelas	1	2	0
Inanition	1	2	11
	28		

The pneumonia cases occurred during the months of March, April, June, and August. Three of the 6 pneumonias were in septic cases, and may possibly have been of embolic origin. Two of the pneumonia cases came to autopsy.

Of the 3 deaths from sepsis, 2 were due to erysipelas.

Died with Recurrence. Two hundred and eighty-two patients died with symptoms of local or internal recurrence. Of this number 254 are reasonably certain to have been returns of the disease, while 28 cases have been classed as probable recurrence, though not entirely beyond dispute. These cases were referred to in the beginning of the paper, and it was stated that it was our intention to err on the side of safety, and to class as recurrences all cases that were not above reproach. The causes of death given in the 28 disputable cases are given in Table V.

The 8 cases of "apoplexy," "paralysis" and "arteriosclerosis" died at 36, 62, 69, 70, 75, 76, and 77 years of age respectively. Seven of these doubtful cases are known to have passed the 3-year period without local recurrence in the scar.

With regard to the remaining 254 cases, dead with recurrence, a more detailed account will be given under the heading of recurrences. It is sufficient here to say that of the whole 282 cases dead with recurrence, the recurrence was local in the scar in 120 cases, and no recurrence in the scar was present in 65 cases. In the other 97 cases data upon this point were not obtainable.

The total number of cases, free from recurrence over 3 years after the operation, is obtained by adding to the 64 cases alive and well, the 7 cases which died of other diseases without signs of recurrence over 3 years after operation —a total of 71 cases in which the operation may be presumed to have been successful. In view of the possibility of late recurrence, however, we do not wish to describe these cases as "cures."

Died of Operation. Fifteen cases died as an immediate result of the operation — 14 in the hospital and one immediately after leaving. This gives an operative mortality of 15 in 416 cases, 3.6 per cent. Eleven of these deaths occurred in the first 5-year period, out of 215 operations, 5.1 per cent, and 4 deaths in the last 5-year period, 2 per cent.

The causes of death were as follows:

Pneumonia	6
Pulmonary embolism	2
Hemorrhage and shock	4
Sepsis	3
Total	15

The statistics for successful operations at the Massachusetts General Hospital for the 10-year period are thus:

Three hundred and seventy-six cases of primary operation for breast cancer, with 71 cases free from recurrence 3 years or more after operation, 18.8 per cent. (This includes palliative operations and deaths from operation.) Fifty-six of these cases had only palliative operations performed, and although 4 of these palliative operations were unexpectedly successful, they should not be counted in an estimate of the success of operations for radical cure of the disease. Leaving out the palliative cases, therefore, but retaining the cases which died of operation, we have 320 cases of radical operation with 67 successful results, 20.9 per cent for the whole 10-year period. The results during the last 5-year period, when the more extensive operations have been performed are better than those from 1894–98 inclusive. During the first period there were 160 operations for radical cure, with 26 successful results, 16.2 per cent. During the last 5-year period, from 1899–03 inclusive, there were 157 operations for radical cure, with 41 successful cases, 26 per cent. It should be noted that the 15 cases of death due to operation, have been counted as unsuccessful cases in these estimates, and have not been taken out from the entire number, as has been done in a certain number of other reports upon the end-results of cancer operations. We have wished to give a fair estimate from the patient's point of view, and to the patient the operation is equally a failure whether it causes her death immediately, or fails to remove the whole of her disease.

Such facts as we have been able to collect will be arranged under 4 main headings:

1. Extent of involvement.
2. Variety of cancer.
3. Duration of the disease.
4. Magnitude of the operation.

The extent of involvement is perhaps the most difficult point to determine, from a clinical

point of view, as the symptoms do not invariably agree with the underlying pathologic conditions. We have not attempted to make any study of the size of the tumor as stated in the clinical examination of the patient, as these data were considered to be of significance only in connection with the variety of cancer present. The extent of involvement has been considered under the following headings:

a. Adherence to skin.
b. Adherence to chest.
c. Enlarged glands in axilla.
d. Enlarged glands in neck.
e. Cancer of both breasts.
f. Cancer of special anatomical structures.
g. Ulceration.

Adherence to Skin. Clinical records with regard to the adherence of the tumor to the skin were given in all but 41 cases. The skin was adherent in 262 cases, with 42 free from recurrence, 16 per cent. The skin was *not* adherent in 71 cases, with 23 free from recurrence, 37 per cent. It is obvious, therefore, that the absence of this symptom is of relatively good prognostic import.

Adherence to Chest-wall. The tumor was recorded as adherent to the chest-wall in 45 cases, of which 5 were free from recurrence, 11 per cent. No adherence to the chest-wall was recorded in 194 cases, with 41 successful results, 21 per cent. Another point of relative prognostic value that again bears out the accepted symptomatology of this disease.

Enlarged Glands in Axilla. Glands were felt in the axilla in 236 cases, of which 28 were successful results, 12 per cent. The records state that no glands were felt in 117 cases, 34 of which remained free from recurrence, 29 per cent. This fact is made more emphatic when we consider that it is the greatest exception for the glands, removed as a routine from the axilla, to be found free from cancer on microscopic examination. It is, therefore, obvious that the presence of palpable axillary glands is indicative of such a degree of involvement of those glands with cancer, as to make the complete removal of the disease far more difficult than in earlier and less extensive cases. It is quite possible that in early cases, without palpable enlargement of the glands, the disease is entirely within the glands, and can be readily removed, whereas in glands which are palpably enlarged the disease has extended through the capsule and along the lymphatic trunks, and becomes disseminated through the axillary fat to such an extent, and in such minute strands, that complete removal is very difficult, if not impossible, of achievement.

Enlarged Glands above the Clavicle. In 40 cases enlarged glands were felt above the clavicle before the primary operation, and of this number only 2 cases survive. In neither of these 2 cases were the glands removed found to be cancerous on pathologic examination. Thus, not a single case in this series, with palpably enlarged cancerous glands above the clavicle before the primary operation, has been cured of the disease. This confirms the idea that cancerous glands above the clavicle practically contraindicate an operation for radical cure.

Cancer of Both Breasts. Both breasts were involved in 6 cases. In 4 both breasts were amputated. In 2 one side alone was removed. Five cases died with recurrence, and one of sepsis, following the operation. It is not probable that radical operation will succeed in saving many cases of double cancer of the breast.

Involvement of Exceptional Anatomical Structures. In 3 cases the axillary vein was involved in the disease, or was seriously torn and had to be removed — all of these patients died with recurrence. In one patient, who unfortunately, could not be traced, the mediastinum was opened, and cancerous glands removed by the resection of the second and third rib cartilages on the right side. In another case cancerous portions of the ribs and of the sternum were removed with a chisel and curette, but without success, and in a third, the brachialis anticus muscle was found infected and removed.

Ulceration of the Tumor was present in 60 cases of which 4, 6.6 per cent, were free from recurrence. No ulceration was present in 316 cases, of which 67 remained well, 21 per cent. The deduction is obvious, that ulceration is of bad prognostic import.

The varying degrees of malignancy of the different varieties of cancer form one of the most interesting features of the study of cases of cancer of the breast. In this series of 376 cases,

pathologic reports were not obtainable in 39 cases, and the report gave the diagnosis of "cancer" only, without specifying the variety, in 127 cases. In the other 212 cases detailed reports were available.

Medullary Carcinoma. There were 137 cases of medullary carcinoma, of which 105 survived the operation for radical cure. (In estimating the malignancy of the different varieties of cancer, palliative operations and cases dying of operation have been excluded as contributing in no way to information upon this point.) Of these 105 cases, 20 were free from recurrence, 19 per cent.

There were 46 cases of scirrhus carcinoma, 43 of which survived the operation for radical cure; of this number 10 were successful cases, 23 per cent.

Of adeno-carcinoma, there were 24 cases, of which 21 survived the radical operation. Ten of the cases are free from recurrence, 47.6 per cent.

There were 4 cases of colloid carcinoma, one of which was a palliative operation. Of the 3 other cases, one died without recurrence at 7 years, 8 months; one is now alive with recurrence 11 years after operation; and one is alive and well 3 years and 2 months after operation; giving 60 per cent of successful operations.

TABLE VI
Variety of Carcinoma

	Cases	Cases surviving radical operation	Cases free from recurrence	Per cent
Medullary	136	104	19	18.2
Scirrhus	46	43	10	23.
Adeno-carcinoma	24	21	10	47.6
Colloid	4	3	2	66.
Cancer, variety not specified	127	107	18	16.8
No pathologic report	39	31	8	25.8

From these facts it is clear that of the 4 main varieties of carcinoma of the breast, medullary carcinoma is the most grave, scirrhus is less serious, and adeno-carcinoma and colloid carcinoma are relatively the least malignant varieties of cancer. This is in accord with the experience of other writers, and is, in fact, the generally accepted belief.

Other rarer varieties of cancer have occurred in this series of cases, but in numbers scarcely large enough to justify definite conclusions. Thus, there was one case of "cancer cyst" alive and well 4 years after operation. There were 8 cases of Paget's disease of the nipple, of which only one survives, 12½ per cent. There were 7 cases of radical operation for cancer in the lactating breast (commonly regarded as one of the gravest possible conditions), but of this number 2 are now alive and well, 28.5 per cent.

The duration of the disease, as estimated from the clinical history of the patient, gives very unsatisfactory data for the formation of an opinion as to the probability of successful operation. No constant increase or diminution of successful operations is observed with increasing duration of the tumor.

It is probable that the duration is not estimated accurately by the patient in many cases, and it is certain that other considerations, such as the variety of the tumor and the extent of involvement of the tissues with disease, are of far greater significance than the mere duration of the tumor taken by itself. It would be futile to deny that, in the individual case, the longer the duration the less the expectation of cure; but in a collection of many cases this fact is of relatively minor significance as compared to other considerations. It is true that the percentage of successful cases was somewhat greater when the disease was of from 1 to 6 months' duration than when it had lasted from 6 to 12 months, but the per cent of recoveries was greater still in the long standing cases of from 2 to 15 years' duration. Of the 375 cases in which we have collected these statistics, the results appear in the following table:

TABLE VII
Duration

TIME	No. of cases	No. of successful cases	Per cent
1 to 6 months	148	30	20.
6 to 12 months	108	18	16.6
Up to 1 year	256	48	18.7
1 to 2 years	70	13	18.5
2 to 15 years	41	10	24.

The Magnitude of Operation. The extent of the operation performed upon these 376 cases

was indicated by the classification into four groups of operations: *Complete, Semi-complete, Incomplete,* and *Palliative.* Each of these groups will now be taken up for detailed consideration.

TABLE VIII
Operations

	Total cases	Alive and well	Alive with rec.	Died of op.	Died without rec.	Died with rec.	Successful cases	Per cent successful
Complete operation	160	24	4	7	2	123	26	16
Semi-complete....	75	18	0	3	1	53	19	25
Incomplete	85	20	4	1	2	58	22	25
Palliative..	56	2	0	4	2	48	4	7

Complete Operations. One hundred and sixty cases had a complete operation performed, including the removal of the whole breast and axillary contents, the removal of the pectoralis major muscle and either division (4 cases) or removal (156 cases) of the pectoralis minor. The results of these 160 operations were as follows: Seven died of operation; 123 died with recurrence; 2 died without recurrence, 4 are alive with recurrence, and 24 alive and well. There were thus 26 successful cases, 16 per cent.

In 26 cases the neck was dissected for the removal of glands above the clavicle. In 7 cases the glands were felt before operation. In the other cases the neck was dissected as part of the routine operation. Of all the 26 cases, 3 survive — one in which the glands removed as a routine measure were found to be cancerous; the other 2 cases in which enlarged glands were felt and removed, but were not found to be infected.

The question of whether removal or division of the pectoralis minor is the safer procedure cannot be answered by these statistics, as division of the minor without removal was done in only 4 cases. These cases all died with recurrence.

The amount of skin removed with the breast has seemed to the writers a matter of great importance, and yet accurate data cannot be obtained for the comparison of results from the hospital records. It was possible, however, to contrast the cases in which the wound was closed directly by suture, with those in which so large a skin defect was made that a plastic operation of skin-graft was required to close the wound. In 67 of the complete operations, a plastic operation (either the flap-operation of Dr. J. Collins Warren, or the sliding over of the other breast after the method of Dr. S. J. Mixter or a skin-graft) was performed. Of this number 13 were successful cases, 19.4 per cent. Whereas in the 93 complete operations in which the wound was sutured directly, there were only 11 successful cases, 11.7 per cent. The difference between these cases was even more marked when local recurrence was considered. Of the 67 cases with plastic operation or skin-graft, statements with regard to the presence or absence of local recurrence were available in 52 cases, and in 30 of these, 57.6 per cent, no local recurrence in the scar took place. Of the complete operations in which the wound was sutured directly, data were available in 68 cases, and 30 remained free from local recurrence, or only 44 per cent. This we believe is good evidence of the importance of removing a very generous amount of the skin over the breast in radical operations.

Seventy-five operations were classed as *semi-complete.* In these cases the complete operation was performed, as detailed above, with the exception of the division or removal of the pectoralis minor. In these cases the minor was not disturbed. Of the 75 cases, 18 are alive and well, and 1 dead without recurrence; 19 successful cases, 25.3 per cent. The greater number of these semi-complete operations (46 out of the 75) were performed in the 5-year period from 1899–1904.

Incomplete Operations include those performed with a view to radical cure, but in which the requisites of the complete or modern operation were not complied with. In the majority of these operations the pectoralis major was not removed; in some the whole breast was not taken, and in others, the dissection of the axilla was incomplete. There were 85 such operations; the greater number of which came in the earlier years, from 1894 to 1898. The results, however, were surprisingly good, as there were 22 cases free from recurrence, 25.9 per cent.

These percentages are somewhat disconcerting, and suggest, at first sight, that better re-

sults are to be expected from the less radical operations. This supposition, however, is not to be entertained, and another explanation must be sought. After some consideration we have come to the conclusion that the explanation of this apparent paradox lies in the choice of cases for operation. Before the complete operation came to be generally practised, surgeons performed an incomplete operation, to be sure, but they performed it only in such cases as by the small size of the tumor and freedom from attachment to skin and to muscle, gave promise of possible cure. As the complete operation developed there appeared to be hope of saving cases of a more advanced character, and the complete operation has undoubtedly been performed in many cases in this series in which the wide extent of the disease made a successful result a practical impossibility. This fact has been appreciated by a number of the surgeons at the hospital, and the complete operation is now applied by them more conservatively, and only to the early cases in which a cure may reasonably be expected; while other surgeons perform the complete operation in nearly every case, with the idea of giving every chance for cure, however remote that chance may be.[2,3] It is due to these facts, we think, that the results of the complete, as compared to the incomplete, operations make so poor a showing. So far as the semi-complete operation is concerned, the removal of the pectoralis minor, except for allowing easier exposure of the axilla, does not in our opinion remove tissue which is especially liable to cancerous infection and is not, for that reason, a detail to be insisted on.

Palliative Operations were performed in 56 cases, or 15 per cent of the cases operated on. These operations were done without hope of radical cure, and cancerous tissue was believed to have been left in the wound at the close of the operation. Four of these cases, however, were free from recurrence; two alive and well 9 years and 9 months, and 5 years and 9 months, after operation. Two others died without recurrence — one, 9 years after operation, of old age and debility at 71; one, 4 years and three months after operation, of renal disease. In one of these cases, now alive and well, a supposedly benign tumor was excised under cocaine and found to be carcinoma. The patient refused further operative treatment and has had no return of the disease. The operative mortality of the palliative operations, 4 cases out of 56, 7 per cent, was higher than with any other class of operation, but is attributable, in our opinion, to the feeble condition of patients with advanced cancer, rather than to the severity of operation. At this point it may be reasonable to call attention to the fact that the cases we are reporting have not been selected in any way, but are given as they are recorded consecutively in the hospital records. Thus 85 per cent of our cases have been subjected to an attempt at radical cure, whereas the number of cases really entitled to expectation of benefit from a radical operation was probably much less. We would suggest that statistics of end-results could be judged more fairly if the number of cases rejected as unfit for radical operation, during the same period, were also published.

Recurrences. The many different forms in which cancer makes its reappearance after attempted radical operations for its removal is one of the most interesting features of that disease. In 178 of 290 cases, the site of recurrence could be determined, and in several cases the disease returned in two or more different portions of the body.

Site of Recurrence. Data upon the presence or absence of recurrence in the scar, or in internal organs, were available in 264 cases and the organs and regions involved appear in the following table:

TABLE IX

Site of Recurrence in 264 Cases

Local in scar	126
No local recurrence in scar	138
Lymphatic glands	58
Other breast	15
Spinal	19
Other bones	14
Cranial	13
Lung and mediastinum	65
Abdomen	51
Disseminated	11

It is of interest to note the fact that of 264 cases in which data were obtainable, no local recurrence took place in the scar in 138, 52 per cent. In over one half of the cases operated

[2] Lazarus-Barlow and Campiche, Archives of Middlesex Hospital, vol. v, 1905.

[3] Meissl, Wien. klin. Wchnschr., Dec. 22, 1904.

upon, the local disease was removed, and the patient would have been cured if metastasis in internal organs had not already taken place, or did not result, as seems possible in certain cases, from the manipulations of the operation. It is to be remembered also that the proportion of cases free from local recurrence after complete operations with plastic or skin-graft (57.6 per cent) was greater than when other less extensive operations were performed.

The relative frequency of metastasis in the chest and in the abdomen, is to be attributed, we believe, to the predisposition of the tissues of the lung and of the liver to cancerous metastasis. It is apparent that the substance of the lungs, the liver, and the bony skeleton, are especially fertile soil for cancer growth. The lymph-glands affected in recurrence are those especially of the axilla, the supraclavicular region, and the mediastinum. Recurrence in the other breast occurred in 15 cases. The number of spinal recurrences is notable (19), as being greater in number than all of the other bones. It is not proved by autopsy examination, but probably the majority of recurrences in the spine are due to bone metastasis, rather than to recurrence directly in the spinal canal or in the cord.

The 14 cases of recurrence in other bones are divided as follows: In 1 case both the sternum, ribs, and humerus, were affected; in 11 cases the sternum and ribs were involved; and in 2 cases recurrence took place in the femur.

The cases of cranial recurrence are mainly those of death with symptoms of cerebral hemorrhage. In this group have been included, also, cases dying of "meningitis," "brain tumor," and "Arteriosclerosis." The occurrence of symptoms of apoplexy as a terminal phenomenon, due to hemorrhage into the tumor, in cases of metastatic cancer of the brain, has been so constant in our experience as to give little room for discussion on the propriety of classing cases of apoplexy as cranial metastases unless proof to the contrary can be presented.

The exact date of appearance of recurrence after operation could not be obtained in the majority of the cases here considered. The duration of life after operation, however, gives some light upon this point and has been arranged in the following table:

TABLE X

290 Recurrences.	Duration of Life after Operation
Not stated	16
Up to 1 year	83
1–2 years	88
2–3 years	44
3–4 years	25
4–5 years	11
5–6 years	3
6–7 years	9
7–8 years	5
8–9 years	2
9–10 years	1
10–11 years	1
11–12 years	2
Total	290

Forty-one of the 290 recurrent cases, 14 per cent, lived over 3 years after the operation, and of this number 13 never showed any local recurrence and 28 had recurrence in the scar. It is clear that the statement that a case survived 3 years after operation, even without a local recurrence, does not indicate in the least that this will be a successful result, although such evidence has been offered in many different reports of the results of operations for cancer of the breast.

Late Recurrence. As has been stated in the preceding paragraph, 13 cases lived over 3 years without local recurrence, only to die later of internal metastasis. Four other authentic instances of late recurrence appear in this series of cases; 2 of these had local recurrence in the scar of operation, which did not appear until 8 years, and 8 years and 5 months, respectively, after operation. One was free from signs of recurrence for 7 years, and then developed evidence of recurrence in the spine; and another for 6 years and 9 months, and then developed evidence of recurrence in the abdomen. Thus 17 cases out of 290 had recurrences. either internal or in the scar, which did not appear until over 3 years from the date of operation; or, otherwise expressed, of 88 cases (64 alive and well, 7 dead without recurrence, and 17 late recurrences) which survived the 3-year period without evidence of recurrence, 17 showed later recurrence or metastasis, 19 per cent. This is the exact percentage of late

recurrences given by Schröder [4] as a result of the study of 347 cases of cancer of the breast from the Rostock Clinic.

Age of Patients. The age of the patient has been considered by a number of writers to be of some value in prognosis, on account of the supposed virulence of cancer in younger women. This, however, is not borne out by our statistics, and in fact no regular increase or diminution of successful results is found with advancing years.

TABLE XI

Ages of Patients

AGES	No. of cases	Free from recur.	Per cent successful cases
20–30	5	1	20
30–40	56	4	7
40–50	120	29	24
50–60	107	16	15
70–80	21	2	9
Not stated	2		

It is probable that the variety of cancer and its extent is of much greater importance than the mere age of the patient. Possibly the occurrence of scirrhus cases, late in life, has given rise to the supposition that patients of advanced years were entitled to a more favorable prognosis. This we do not believe to be the case.

Situation of Tumor in the Breast. We have believed that tumors situated in the inner hemisphere of the breast were, as a rule, more likely to produce mediastinal metastases than those in the outer quadrants which spread more directly into the lymphatics of the axilla (Oelsner).[5] With this in mind, we have divided the 376 cases into 3 groups as follows:

TABLE XII

Inner vs. Outer Hemispheres

	No. of cases	Free from recur.	Per Cent successful cases
Inner hemisphere	43	10	23
Outer hemisphere	160	43	27
Central location, whole breast, or situation not stated	173	18	10

The difference, though slight, is in favor of the tumors in the outer hemisphere. The extreme gravity of the last group — the tumors situated in the central portions or involving the whole breast — is undoubtedly due to the advanced stage of growth at which most of these cases came to operation.

Oöphorectomy. Before proceeding to summarize the results of this investigation, it is to be noted that 3 of the cases in this series had the operation of oöphorectomy performed (Beatson's operation), for inoperable recurrence. One patient lived 3 years; 1, 6 months; and 1, only 1 month, after the operation, and all died of recurrence. Another case, which was operated upon in another clinic, entered for recurrence, and had Beatson's operation performed at the Massachusetts General Hospital, but died a few months later. It was not shown in any of these cases that oöphorectomy delayed in any way the progress of the disease, even in the case which lived 3 years; for two operations for local recurrence were required during that time.

SUMMARY

1. Out of 416 cases of primary operation for cancer of the breast at the Massachusetts General Hospital from 1894–1903 inclusive, 376 were traced to a conclusive end-result at an average period of 8 years after operation.

2. Sixty-four cases were alive and well, and 7 died without recurrence over 3 years after the operation.

3. Counting in the operative mortality, there were 320 attempts at radical cure, 67 of which, or 20.9 per cent, were successful.

4. During this same period palliative operations were performed on 56 patients (15 per cent) and 52 cases were discharged untreated.

5. Cases in which the tumor was ulcerated, or was adherent to the skin or to the chest wall, and cases in which the axillary glands were palpably enlarged, gave notably less promising results than when these conditions did not exist.

6. No case with palpably enlarged cancerous glands above the clavicle, and no case of cancer of both breasts, was cured.

7. Medullary carcinoma was more grave than that of the scirrhus type, and adeno-carcinoma and colloid were relatively of a far less malignant type.

[4] Schröder, Beitr. z. klin. Chir., Bd. 45, Hft. 3, p. 659. Cf. also, Curtis, Annals of Surgery, xliii, p. 216.

[5] Oelsner, Arch. f. klin. Chir., 1901, Bd. 64, p. 134.

8. The duration of the disease and the age of the patient, other than in the individual case, exerted little influence on prognosis.

9. Extensive operations with wide removal of skin gave the greatest freedom from local recurrence. Removal of the pectoralis minor appeared to be of slight significance. Incomplete operations on early cases yielded better results than extensive operations on cases which were well advanced.

10. Recurrence in the scar occurred in less than one half of the cases. Internal metastasis was most frequent in the lungs, mediastinum, in the axillary, and supraclavicular glands, the liver, and the spine.

11. Seventeen out of 88 cases, or 19 per cent of those passing the 3-year limit without evidence of recurrence, showed recurrence later, and 4 cases developed recurrence 6 years or more after the operation.

END-RESULTS IN OPERATIONS FOR CANCER OF THE BREAST[1]

By A. F. JONAS, Omaha, Nebraska

OF all cancers found in women, the breast, next to the uterus, is the most frequent seat; and of the total number of cancers in men and women, it occupies third place — the uterus and stomach are the only organs more frequently affected. The breast seems to occupy a very important relation to the genital apparatus. Its development to its full function is combined with a growth of connective tissue, blood- and lymph-vessels, and no other organ is exposed to such frequent nutritive changes and functions as the mammary gland. Added to this the breast gland is subjected to constant developmental changes, often of a retrograde character. These facts, may, in a measure, have something to do with the origin of cancer, because mamma carcinoma is unknown before puberty. The frequency of breast tumors seems to occupy a direct relationship to the genital organs.

It has been shown that 80 to 86 per cent of all breast tumors are carcinomata, and that has been the writer's experience as will be shown by the appended table.

Carcinoma is nothing more nor less than a proliferation of epithelial cells that have extended beyond physiologic limits, and have destroyed normal organic tissues. The malignancy of a carcinoma is dependent upon this advance of new-formed epithelial masses beyond normal bounds.

From a practical standpoint, we may divide carcinoma into two general groups, namely, *soft growths* which are made up of a large cell-proliferation, and *hard growths*, in which there are few cells and much connective tissue.

While it is intended at this time to discuss only epithelial growths, the author has taken the liberty of introducing all the neoplasms of the breast that have come under his treatment, in order that the relative proportion of epithelial, and non-epithelial, growths may be shown. A considerable number of both operable and non-operable growths that were seen only in the consultation room, which did not return for treatment, are not included here.

The total number of neoplasms of the female breast that have come under the writer's observation, which were operated during 20 years, and of which it has been possible to obtain more or less complete data, comprise a list of 260 cases. These cases have been classified according to their histologic component parts and may be divided into the following groups:

1. Fibro-adenoma	31
2. Adenoma	2
3. Myxoangioma	1
4. Cystoma	2
5. Lipoma	5
6. Atheroma	1
7. Sarcoma	7
8. Carcinoma	211

[1] Read before the American Surgical Association, May 7, 1907.

It will be seen from the above table that the non-epithelial growths comprise 18.5 per cent of the total number and that 81.5 per cent are of epithelial origin. The latter form that large group known as carcinoma or cancer, and have been subdivided according to their microscopic findings as follows:

a. Acinous carcinoma..... 105
b. Tubular carcinoma..... 75
c. Scirrhous carcinoma..... 25
d. Colloid carcinoma..... 6

In briefly detailing our experience we have followed the above classification and we find,

1. Acinous carcinoma forms partly soft and partly hard nodules; usually, however, they comprise the soft cancer, and in its most dangerous forms they are of the medullary variety. The more or less firm stroma is filled with round cells, and the carcinoma proliferation is found to be composed of epithelial cell-masses, which form large irregular acinous-like groups. In their interior, early degenerative changes occur, which lead to softening and early ulcerative changes forming crater-like ulcers. From these craters proliferate sponge-like granulations, which soon melt down. Under this head there came to operation at our hand 105 cases.

2. The tubular carcinoma is characterized by a growth of epithelial masses in the form of elongated branched cylinders which very soon extend beyond the bounds of the original acini, rapidly producing an acinous confluence. It spreads superficially and infiltrates the neighboring tissues. The cell-nests are long and tubular. The connective-tissue cell-infiltration progresses at the same rate. As the growth progresses, neighboring tissues are invaded, namely skin, adipose tissues, muscles, ribs, and pleura, and axillary glands which is shown by more or less numerous carcinomatous nodules in all these tissues. Sometimes the skin of the breast and back and arm may become infiltrated with carcinomatous nodules so extensive as to form a hard, thickened, uniform, board-like, mass extending from sternum to spine, known as *cancer en cuirasse*.

With tubular carcinoma, cell degeneration is slower, and takes place much later than in the acinous form. The softened cellular material is absorbed and eliminated by lymphatics and veins, and the remaining connective tissue contracts, forming the interstitial cicatrix which is manifest by the retracted nipple. Of the tubular-carcinoma form, our list contains 75 cases that were operated.

3. The scirrhus. The atrophic cancer is known by its slow growth, the disappearance of carcinomatous cells, and a resultant cicatricial connective-tissue contraction. The connective tissue preponderates and the epithelial nests are small and sparsely distributed. Of this variety 25 cases were removed by operation.

4. The colloid cancer is rare, only two cases appearing in our tables. Such cancer-masses, when incised, present mucoid, jelly-like transparent masses, imbedded in a connective-tissue stroma. According to Lange the colloid masses are formed of a mucoid softening of connective tissues, surrounding the cancer-masses, and with this mucoid degeneration occurs a simultaneous destruction of cancer-cells and their disappearance. Colloid cancers grow slowly and of all forms they offer the best prognosis.

No cases of carcinomata or other growths have been included in the above list, prior to 20 years ago, because all the writer's cases, operated before that time, were treated by a removal of the primary nodule or the entire breast, without a systematic removal of the axillary contents. Our knowledge of the pathology of breast neoplasms, and especially the early and widespread carcinomatous dissemination to axilla and frequently to the supraclavicular triangle, has become so well-founded, that no modern surgeon would have the temerity to stop short of a complete removal of the entire breast and axillary contents in the very early cases, and in later ones remove, in addition, both pectoral muscles and the fat from the supraclavicular triangle.

All of our operations, as tabulated above, have been done in this radical way. And in a number of instances portions of one or several ribs were removed wherever there was the slightest indication of the neoplasm having approached a rib. There were 30 secondary operations of our own cases which have not been included in the above list. Nor does this table comprise 14 other secondary operations, in cases done primarily by other surgeons. Of our own 30 secondary operations, 15 cases

underwent a third operation; 5 were subjected to a fourth operation; and 1 to 5 operations, all of these for local recurrences. All of the writer's cases were cautioned to return immediately when the least suspicion of a recurrence should take place.

Briefly we may say that our operative experience comprises 211 primary operations for cancer of the breast; 30 operations for local recurrences in our own cases; and 14 cases done primarily by other operators totaling in all 255 cases. Out of this number there were 6 deaths.

Deaths. Two cases died from sepsis; one case, secondary operation, where the breast only had been removed by another operator. The axillary and supraclavicular involvemnet was extesnive. The axilla was completely cleaned out, and the supraclavicular extirpation was almost complete, save for a node that was adherent to the subclavian vein, while under the gentlest possible manipulation the blunt dissector punctured the vein, allowing the entrance of a large quantity of air. The heart-beat immediately increased to 160 per minute. The opening in the vein was immediately grasped between the two fingers; it was accurately closed with a running silk suture. The heart-rate, however, did not improve and she died in 24 hours. Another case died from an overdose of chloral hydrate, self-administered.

The last case died from secondary hemorrhage on the thirteenth day. During the operation the axillary vein was completely torn across on account of carcinomatous involvement. Suturing was out of the question so both ends were ligated, which can be done without fear of permanent circulatory disturbance, because the collateral circulation takes place through the cephalic vein.

Accidents. The axillary vein was completely torn in 2 cases. The 1 recovered without untoward symptoms. One died from secondary hemorrhage. The left subclavian vein was punctured once, admitting a quantity of air, the patient succumbed 24 hours later.

Of the 12 cases in which one or more ribs were resected, for the removal of deep-seated carcinoma, the pleura was punctured 5 times. Once only did the condition following seem alarming. The patient went into collapse with a pulse rate of 140°, the latter remaining so for several days; recovery eventually took place, however. The axillary and subclavian arteries were never wounded. The important nerve trunks of the axillary plexus never were divided in any of our cases.

End-Results. We now come to the most difficult part of our theme, "The End-Results." The author has tried for many years to maintain a correspondence with his patients, not only in the class of cases under consideration, but in other classes of patients as well, but his efforts have been feebly rewarded. In many of his breast cases it has been possible to follow them for a year or two, and many until they had reached the usual time limit of 3 years — many cases having passed the period when a cure was considered permanent, namely 3 years. A systematic correspondence was attempted but the responses to inquiries were not numerous, so that the information was gained largely by personal interviews, inquiries, through friends and relatives. Many of the cases had disappeared from their former places of residence and no trace could be found of them.

PRIMARY OPERATIONS FOR CARCINOMA

	Total	Disappeared	Considered here	Recurred in 1 year	Recurred in 2 years	Free after 3 years
Acinous ..	105	21	84	25	19	40
Tubular ..	75	10	65	12	8	45
Scirrhous .	25	1	24	1	5	18
Colloid ...	6	2	4	0	2	2
Total ..	211	34	177	38	34	105

Secondary operations for recurrence, own cases 30.
Secondary operations for recurrence, other surgeons cases 14.

The final outcome of the secondary operations is not known, in most of the cases, consequently it is impossible even to approximately estimate the final results.

From the above table it will be seen that out of a total number of 211 primary operations, 34 cases could not be found, and their fate is unknown to the writer, consequently they must be left out of consideration entirely. This leaves 177 cases whose condition was known up to and beyond 3 years after operations. It will be noted that there were 38 recurrences in one year, and 34 the second year, leaving 105 cases

without recurrence at the end of 3 years, about 56.7 per cent.

Now this does not indicate the real percentage of permanent recoveries. Among our cases that came to operation for recurrence there was one case operated by another surgeon, that had remained free for 15 years; another case had apparently been well for 10 years; another for 8 years; and another for 5 years.

In our series the larger number of recurrences were found among the earlier operations, and a smaller number among those operated in more recent times. This is due no doubt to 2 factors, the first, that at the present time every lump in a woman's breast is regarded with suspicion and an immediate radical operation is advised, consequently a larger number come to operation early, before extensive secondary involvement occurs. And secondly, radical operation, which means removal of the entire breast, together with the axillary contents in *all* cases; and also, where axillary involvement can be demonstrated on opening the axillary space, of the pectoral muscles.

The fate of all the recurring cases can be briefly stated. They finally all ended fatally. An attempt was made to ascertain the exact locality of the recurrence, the progress, later involvements, complications, metastases, and swelling of the arm, due to vascular involvement. But the available data were so meagre as to be of no value, therefore this phase of our subject cannot be discussed here.

The functional results, so far as the movements of the arm are concerned, on the whole were good. In our earlier cases, where the incision was made along the lower border of the pectoralis major, the resulting scar sometimes caused a limitation of outward and upward movements of the arm. In our later cases a modified curvilinear incision (E. Senn) was made, the curve reaching almost to the clavicle. This method seemed to eliminate limitation of movement due to scar contraction. However, some motor restriction seemed to be due to subcutaneous cicatricial contraction in the axilla. This seemed to be due to a partial distention of the axilla by serum and blood, in spite of methodical tubular drainage. This complication, in part at least, was overcome by stitching the middle portion of the axillary flap up high against the chest wall, in accordance with a suggestion of Miles Porter of Fort Wayne, Indiana. This prevents the formation of a dead space in which fluids can collect. The loss of function from a removal of both pectoral muscles was insignificant. In 1 or 2 years there seemed no marked restriction of motion on this account.

A more or less severe post-operative swelling of the arm occurred in a number of instances, owing, no doubt, to a removal of all the axillary lymphatics. This swelling usually disappeared in a few weeks, as soon as a collateral lymphatic circulation had been established. There is no question that there will be a constant improvement in the end-results, because there is a growing unanimity of the profession and laity regarding the necessity of an early and a radical operation.

END-RESULTS FOLLOWING OPERATIONS FOR CARCINOMA OF THE BREAST[1]

By WILLY MEYER, M. D., New York

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IT had been my endeavor to bring a collective report of the final results of operations for carcinoma of the breast, done by the various operators at the German Hospital of New York City. But this proved impossible, for, with the ever-shifting population of this cosmopolitan centre, attempts at tracing cases to end-results usually bring but unsatisfactory returns, and often are connected with unsurmountable difficulties. It took me more than six months of hard work, in 1904, to prepare my statistics. I am, therefore, to-day, in a position to present only my personal statistics of cases operated upon by the method first described by me in 1894 (*New York Medical Record*, December 15, 1894) and again more fully in 1905 ("Carcinoma of the Breast — Ten Years' Experience with my Method of Radical Operation," *Journal of the American Medical Association*, July 29, 1905).

In order to be able to pass an opinion on final results, obtained with one and the same operative procedure, all cases of carcinoma of the breast, operated on prior to 1894, were not included in the following statistics.

From September, 1894, to the first of April, 1907, I have performed the radical operation 86 times in 84 patients, 2 having developed the same disease in the opposite breast not long after the first operation.

Of these, 83 were females, one male. The youngest case was 28 years of age, the oldest 72; the man was 44 years old.

Classified into decades, the ages of my patients range as follows:

Between 20–30	1
Between 30–40	14
Between 40–50	38
Between 50–60	18
Between 60–70	11
Between 70–80	2
Total	84

showing the greatest number of cases to have occurred in the fifth decade.

Fifty-three cases were private patients, 31 were operated upon in the wards of the German and Post-Graduate Hospitals. Of the former I have careful records as to their subsequent history; of the latter 4 could not be traced. One of these, operated upon in June, 1903, at the age of 43, was alive and well in January, 1905, but since then has been lost track of.

Again I am greatly indebted to Dr. Martin Rehling, of New York, who rendered such invaluable assistance in compiling my statistics 2 years ago, for his efforts in personally ascertaining the present condition of the surviving ward patients.

Deducting the 4 patients who could not be traced, there remain 80 for consideration here. Sixteen of these were operated upon from 10 to $12\frac{1}{2}$ years ago, that is between September, 1894, and April, 1897, and of this number 1 died of diabetic coma, 48 hours after operation; 8 died of recurrence or metastasis, from 1 to 3 years after operation; 2 lived nearly 4 years, when they died of internal metastasis; 1 was well for 8 years, when she developed regional recurrence; 1 was well and free from recurrence $6\frac{3}{4}$ years, when she died of endocarditis; hence 3, or 18.7 per cent of this series, are alive and well to-day, from 11 to $12\frac{1}{2}$ years after operation namely, $12\frac{1}{2}$, $12\frac{1}{12}$, and $11\frac{9}{12}$ years, respectively, a total of 16.

Twenty-seven patients were operated upon from 5 to 10 years ago, that is, between April, 1897, and April, 1902. Of these 17 died of recurrence or metastasis from 1 to 3 years after operation; 2 died of recurrence nearly five years after operation; 1 (72 years old) lived in perfect health for six years after operation, when she developed a rapidly growing cancer of the stomach in the absence of any local or regional recurrence. One, a pronounced diabetic at the time of the operation, was well for six years,

[1] Read before the American Surgical Association, Washington, D. C., May 7, 1907.

when she succumbed to diabetes, without having developed any signs of a return of the old disease; 6 or 22.2 per cent, are alive and well to-day, from $5\frac{3}{4}$ to $9\frac{1}{2}$ years after operation, namely, $9\frac{1}{2}$, 8, $7\frac{3}{4}$, 7, $6\frac{1}{2}$, and $5\frac{3}{4}$ years, respectively, a total of 27.

One of these latter was operated upon by me for carcinoma of the right breast in March, 1899. In December, 1900, she returned to me with a carcinoma of the left breast which I, then, also extirpated. She has been well and free from recurrence since, $6\frac{1}{4}$ years after the second operation.

From the above it appears that of 43 patients operated upon between September, 1894, and April, 1902, 17, or 39.5 per cent, remained free from recurrence from 3 to $12\frac{1}{2}$ years after operation; or 13, that is 30 per cent, from 5 to $12\frac{1}{2}$ years after operation; 9, or 20.9 per cent, being alive to-day.

Twenty patients were operated upon from 3 to 5 years ago, that is, between April, 1902, and April, 1904. Of these 8 died of recurrence or internal metastasis from 1 to 3 years after operation; 1 died $3\frac{1}{4}$ years after the same; 1, 28 years of age, the youngest of all my patients, had a regional recurrence $2\frac{1}{2}$ years after operation for which she was operated upon and remains *in statu quo* under continued X-ray treatment; 10, or 50 per cent, are alive and well to-day, from 3 to $4\frac{3}{4}$ years after operation, that is, $4\frac{3}{4}$ years, 1 patient; $4\frac{1}{2}$ years, 3 patients; 4 years, 1 patient; $3\frac{3}{4}$ years, 1; $3\frac{1}{4}$ years, 3; and 3 years, 1 patient, respectively, a total of 20.

This latter series includes the only male patient I have had, who is well now, $3\frac{3}{4}$ years after operation.

Seventeen patients were operated upon during the last three years, that is, from April, 1904, to April, 1907: 1, a ward patient, died two weeks after operation of secondary infection, after the principal part of the wound had healed up by primary union, all grafts having taken, the first dressing having been changed on the sixth day, as usual; 5 died of regional recurrence from 1 to $2\frac{3}{4}$ years after the ablation of the breast; 1, 67 years old, has developed a local recurrence 17 months after operation (tumor of the rib right beneath the grafted area); 1, 40 years old, an advanced case, showed a recurrent nodule, surrounding one of the subscapular nerves 11 months after the operation. Immediate extirpation. Regional recurrence (multiple) 3 months later; 9 are alive and well to-day. Total 17.

Of these latter 1 was operated upon $2\frac{3}{4}$ years ago, 7 between April, 1905, and April, 1906, the remaining 1 within the last year.

Thus of the entire 80 patients 28, or 35 per cent, are alive and well to-day, 9 having been operated upon less than three years ago; 4, or 5 per cent, lived from 6 to 8 years after operation; one of these died of a regional recurrence, one of metastasis, two of diseases not in any way connected with the original trouble; 28, or 44.4 per cent, lived from 3 to $12\frac{1}{2}$ years after operation; 5, or 6.25 per cent, lived from 3 to 5 years after operation; 3 others, or 3.75 per cent, though living, have developed either local, regional, or metastatic recurrent growths; 40, or 50 per cent, have died of the disease within three years after operation; 2 died shortly after the operation; 1 on the second day, of diabetic coma, the other after two weeks, of secondary infection; 16 within 12 months, and 8 within 12 to 18 months, or 24, or 60 per cent, within $1\frac{1}{2}$ years after operation.

Reviewing my statistics, I will here refer to a few points in addition to those discussed in my previous paper, which seem worthy of note.

In 8 of the 40 cases that have died within 3 years after the operation, there was neither local nor regional recurrence, death being due to internal metastasis (spinal column, stomach and intestines, mediastinum, and brain). It is plausible to assume, I think, that in many of these cases the infection of the respective organs had existed prior to the operation.

With regard to the desirability of cleaning out the supraclavicular space at the time of operation, even in the absence of clinical evidence of the presence of cancerous glands in this region, I can but say that my own experience does not speak in favor of such a procedure. In none of my 13 patients that remained well from 5 to $12\frac{1}{2}$ years, were the supraclavicular glands removed.

The question as to whether the subscapular nerves should be preserved at all hazards — as strongly advocated by Küstner, 20 years ago [2] —

[2] Centralbl. f. Chir., March 12, 1887.

still remains *sub judice*. Personally I always try to preserve them. I would say, however, that in 3 cases I have seen the first regional recurrent nodule embracing, as it were, the second subscapular nerve, which ran through its centre. In all three of these cases the disease spread in spite of most thorough excision of this nodule. Of course, to sacrifice one or more of the subscapular nerves in all cases would entail great hardship for the patient, in view of the resulting disability as regards the proper use of the arm. In three cases the axillary vein was removed together with the mass, from a point just below the entrance of the cephalic to a place corresponding to about the beginning of the bicipital sulcus. This procedure wonderfully facilitated the otherwise particularly difficult work. No disturbing sequelæ, were observed. Of course, great care was taken not to interfere with the cephalic vein or with the proximal part of the axillary beyond the entrance of the former.

Edema of the arm has been a rare observation in my cases. I have noted it in a transitory shape in about 10 per cent. The cicatrix has oftener been the causative factor, than glands, compressing the subclavian or axillary vein. In only one of my patients did it persist to some extent. This one was operated upon $4\frac{1}{2}$ years ago.

The post-operative neuralgia or neuritis of the brachial plexus has proved to be temporary in every instance. Of the prevention of these sequelæ, by means of Murphy's muscle plastic, I am not yet in a position to speak, owing to lack of personal experience so far.

I think it worthy of special mention that every one of my patients has full use of the arm.

That the extent of involvement is an important factor regarding the prognosis of the case, stands to reason. If the disease has reached an advanced stage, especially when there is involvement of the supraclavicular lymphatic glands, there is little hope for a longer freedom from recurrence. Every one of such patients, operated upon by me, died soon after. Eight of these cases are valuable for conclusions. In two, these glands were primarily removed with the other tumor; in five, secondarily, in the absence of either local or regional recurrence. None of these lived longer than nine months. The eighth patient, in whom another surgeon had done a rather conservative operation $2\frac{1}{2}$ years before she came to me with local recurrence, and upon whom I then performed my radical operation, plus cleaning out of the supraclavicular space, lived 21 months.[3]

In spite of the sad prognosis of these cases, I nevertheless think the removal of the glands, if enlarged, should be undertaken in every instance, for I consider it the surgeon's duty to extirpate whatever can be reached with the knife, so long as metastases do not forbid such a procedure. Sometimes life may be prolonged more than seems possible at first sight, as the case just cited well illustrates. This patient lived for $1\frac{3}{4}$ years in the full enjoyment of life. Then a tumor in the mediastinum caused death, local and regional recurrence as well having taken place.

It will be interesting to scan the cases with regard to the seat of the primary breast tumor. If the growth is found in the upper two quadrants of the breast, particularly if it involves the skin and the subcutaneous tissue over this region, infection of the supraclavicular gland may be expected (Cf. Poirier, Cunéo and Delamere, *The Lymphatics*, page 215). This was found true in the great majority of my cases.

Regarding a possible difference in end-results between scirrhus or adeno-carcinoma of the breast, I can offer no definite conclusions, as the reports with reference to the pathologic variety of the growths are not complete in all my cases. However, judging from the cases that can be utilized for this question, the prognosis of adeno-carcinoma seems less favorable than that of the scirrhous type.

I consider the X-rays valuable in the immediate after-treatment. Every patient is urged to submit to a 6 to 8 weeks' course as soon as healing has been accomplished. I have one case, which at the time of operation, gave a bad prognosis. Here the faithful intermittent use of the X-rays during a number of years had a most gratifying result. No recurrence for 4 years.

The duration of the disease prior to operation naturally plays an important rôle with regard

[3] In this case, as became evident from the symptoms that appeared on the third day after operation, the thoracic duct was injured beneath the clavicle. It closed spontaneously in course of healing.

to end-results. Let me say here that in no case did I refuse the radical operation except metastasis forbade it; of course the earlier it is done the better for the patient. Still I believe the degree of malignancy of the disease and its tendency to rapid proliferation often to be the more important factors in determining the patient's fate. I have a number of cases, especially among my younger patients, in whom I operated at what I consider an early stage, and yet they developed internal metastases, in brain, spinal column, etc., with astonishing rapidity, in spite of the same complete operation. But knowing the treacherous, perhaps even directly infectious nature of malignant disease, we should, even in the face of such sad experience, not allow ourselves to encroach on the magnitude of the operation. Since a refined diagnosis as to the virulency of the disease in the given case is impossible, radical work is a necessity in every instance, and best it seems to me,— such radical work, as does not spare skin,[4] divides the lymphatics first and then keeps outside of the infected area as much as possible, the cuts being made within healthy tissues as far as this can be done at all. In other words, the operation should consist in removing both pectoral muscles with the diseased breast, glands and surrounding fat in one mass.

Even doubtful cases will fare better by such a procedure than by an operation of less magnitude or undue temporizing.

REPORT OF END-RESULTS FOLLOWING OPERATIONS FOR CANCER OF THE BREAST[1]

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IN 1891 I read a paper before the American Surgical Association, and reported 116 cases of cancer of the breast, with less than 1 per cent mortality for the operation which was due to hemophilia, with 5 per cent of local recurrences and 45 per cent of permanent cures, taking the 3-year limit of time as the then generally accepted standard.

In 1895 I read another paper before the same Association, and reported a smaller series of cases. In the list there was another fatal case of hemophilia in which all the major joints were filled with blood, and the greater part of the body affected with subcutaneous hemorrhages. In this smaller series 2 cases had not reached the 3-year limit of time and there was no mortality save the one case of hemophilia just mentioned, and 77 per cent of permanent cures.

These two series of cases show results as to mortality, as to local recurrences, and as to permanent cures, as satisfactory as any that have been heretofore published. The percentage of permanent cures, while high in this small series, does not represent the truth, when viewed later, or after 3 years, as I presently shall show.

In this present contribution I propose to take out 50 cases, from these two series of cases, which were formerly reported permanently cured, according to the 3-year standard, and select such cases as those whose subsequent histories are known, following the end-results after many years. These 50 cases have been selected solely upon the ground of personal knowledge as to their present condition; and they are as a rule private and not Hospital cases. In all of the cases the history has been kept for many years, and nearly all of the patients have been seen or heard from recently.

Now studying these cases in the light of the subsequent history, after many years, the aspect of the whole picture changes. In other words the 3-year limit of time is too short a period to predict a permanent cure.

[4] Often have I seen local recurrence in the skin, closely bordering the grafted area. It is my opinion, that sometimes we are induced to save skin in order to be enabled to close the defect without grafting. This is the reason why I would not make up my mind so far, to adopt Jackson's excellent skin-plasty. (J. Am. Med. Ass., March, 1906.)

[1] Read before the American Surgical Association, May 7, 1907.

I am convinced that a thorough investigation of a limited number of private cases is the only way to arrive at a proper conclusion as to the value of operation in cancer of the breast. This is evident, because it is impossible to follow the history of hospital cases many years subsequent to the operation, as so many cases in this category must be eliminated from the list, as unknown factors. In other words, reliable and absolute knowledge as to a given number of private cases, that can be followed for many years subsequent to the operation, reveals, in the only way possible, the true status of this important question of permanent cures.

In an indiscriminate report of a large series of hospital cases, the elimination of so many from lack of knowledge renders of necessity the report of little value. It is the study of a number of cases, about which there is positive information, that enables one to draw conclusions which are of intrinsic value, in arriving at the true status of the question involved in this most important discussion. I have selected 50 cases to study, and report the subsequent histories, with a view to establishing some opinion as to the value of operation and cure. In the study of the end-results, after many years, of these 50 cases selected in order to have the time of the operation date back many years, the final results reveal some facts of great clinical importance. In some respects the subsequent history of these cases is most satisfactory, and in other cases the end-results are discouraging as to the question of permanent cures.

In this list of 50 cases I have divided the entire number into 3 groups, in order to study them in separate classes after the expiration of many years. I desire to show that surgeons have reported cases as permanently cured, according to an accepted standard established a few years ago, which have not been followed long enough after the 3-year limit of time to state positively that they are permanently cured. By studying the cases in separate groups a better understanding can be reached, as to the real condition of the patients in each class, and at the same time, the grouping of the cases in this way gives general information as to the condition of the sum total of cases, and a more intelligent knowledge of what can be expected in the future.

The first group comprises cases all of which have been cured beyond the 3-year limit of time, and a few even up to 25 years, including a few with local recurrences, in which secondary operations were performed with no subsequent recurrences.

The second group comprises cases which have been cured beyond the 3-year limit of time, but which have died many years after the operation, from causes entirely independent of carcinoma.

The third group comprises cases all of which have been cured beyond the 3-year limit of time, but which have died many years afterwards from metastasis in the internal viscera.

In the first group there were 39 cases reported in the list of 50 of carcinoma of the breast that have been permanently cured. Some of these cases have lived 25 years with no evidence of return, including, however, a few cases with local recurrences in which a subsequent operation has been performed, and the patients immune from any further extension of the disease. All of these cases lived from 5 to 25 years; and all have been watched from time to time, and nearly all of the 39 cases have either been seen or heard from very recently.

This group of cases affords much encouragement as to the possibility of permanent cure. It proves beyond all peradventure that a cure can be established in some cases; which fact can always be a source of hope to those suffering from this much dreaded disease. It remains yet a mystery as to what constitutes the essential conditions to obtain this result. From the character of the operation performed nearly a quarter of a century ago it follows that the operation itself is not the only factor to consider. The morphologic condition of the tumor has much to do with the prognosis, for in no other way can the permanent cure in these cases be explained. The peculiar histologic type of the carcinoma seems to have an influence on the prognosis greater than the now accepted radical operation. There is much to learn in regard to this phase of the subject, and modern scientific investigation will be certain to throw a flood of light upon this dark

subject. It is, however, established beyond doubt, that the more embryonic the cells are, the more malignant the cancer.

The second group comprises cases which have been cured beyond the 3-year limit of time, but which have died many years after the operation, from causes entirely independent of carcinoma. In this group there were 4 cases out of the 50. These cases, for many years after the original operation, were in perfect health. They finally died from acute diseases, so that while they may be said to have been cured, no one can state, owing to the intervention of death, whether in later years a return might not have occurred if they had lived. All that can be said is that no return did occur for many years, and that death resulted from special causes wholly disconnected with carcinoma.

The third group comprises cases all of which have been cured beyond the 3-year limit of time, but which have died many years afterwards from metastasis in the internal viscera. There were 7 cases, in this group of the 50 cases, where the patients lived for many years after the original operation, and who died subsequently from metastasis in the internal organs. The site of the metastasis was not the same in all the cases. In 4 cases the metastasis was in the lung and pleura, in 2 other cases it was in the abdominal cavity, and in another case it was in the pelvic glands and femur. No better illustration of the uncertainty of permanent cures can be adduced than by a reference to a single case in which for 8 years the patient was presumably cured.

In this case I removed a carcinoma, and no return occurred in the breast. The patient was over 70 years old and enjoyed immunity from the disease for a period of 8 years following the operation; when she began to fail in general health and complained of more or less intestinal disturbance. This condition increased for a year, more or less, when a small growth made its appearance in the right iliac region. She died about 6 months later, or about 18 months from the beginning of the appearance of the growth. No autopsy was permitted; but it seemed certain that the growth was a metastasis from the breast though it occurred 8 years after the original operation. This was a case where the patient had lived many years after the standard time, and finally succumbed to the disease, when according to our accepted standard she was supposed to be cured. Even if the time has been extended to 5 years she was not, even with that standard, cured. This case, as well as others in the list, illustrates the important clinical lesson that we must extend our period of time, to feel in a measure more certain of a permanent cure; and that 10 years is a period where one can be nearly certain, from a study of these cases, that a permanent cure is obtained. So few cases have a return after 10 years immunity, that this period of time seems a standard which would include nearly all cases of permanent cure.

In this list of 50 cases each had reached the 3-year limit of time, and were all cured in accordance with the standard. In reviewing at the present time these 50 cases, reported to have been cured, some interesting facts have been revealed. The result of this thorough investigation has demonstrated the important clinical fact that, *First:* Cancer of the breast is sometimes permanently cured, or at least 25 years have elapsed with no evidence of a return. *Second:* That cases may go as long as 18 years and yet finally have a return in some other organ. *Third:* That in the cases in which no return has been observed, the operation was performed, almost without exception, within 6 months from the incipiency of the disease, thus showing the great importance of early operation. *Fourth:* The more radical the operation within reasonable limits, the better the prognosis. *Fifth:* That in some cases, in which the outlook was most unfavorable, as manifested by extensive ulceration, hemorrhage, widespread axilliary involvement, the end-results have been entirely satisfactory.

First: Cancer of the breast is sometimes permanently cured, or at least 25 years have relapsed with no evidence of a return. The 39 cases which were permanently cured, a very few of which have been followed for a quarter of a century, clearly point to the conclusion that surgeons have obtained a mastery over this disease. This is especially true because cancer appears as a rule late in life, and immunity for many years entitles us to claim a cure in

these cases. I am convinced further, that with certain types of cancer, the present radical operation will ensure a larger number of recoveries than have been established in the past.

Second: That cases may go as long as 18 years and yet finally have a return in some distant organ. A brief report of 2 cases illustrates the clinical fact more forcibly than by any general deduction. The first patient suffered from a cancer of the breast upon whom I operated 18 years ago. The tumor was examined by Professor Welch of Johns Hopkins University. After an expiration of 18 years, during which time she has been free from the disease, she consulted me in reference to a small induration in her other breast. The lump was small and situated near the nipple. In the light of her previous history I felt justified in recommending the immediate removal of this breast, to which proposition she, as well as her husband, offered most serious objections. I advised her to consult another surgeon who would give her an independent opinion. This she did and returned with the verdict of not malignant. I then advised her to consult a third surgeon, who advised delay but with the understanding that she was to come to see him again in a month as he might change his opinion. She returned, however, to me and finally decided to have the operation, which I accordingly did, and Professor Ewing made a microscopic examination and pronounced it to be a carcinoma. Two years have now elapsed and she is thus far free from any evidences of a return. It is, however, too soon to predict the outcome in the second operation. This case illustrates the fact that even 18 years may elapse with no return of the disease in the breast, but that after that long period of time a new outbreak or a new carcinoma may appear in the remaining breast. It shows, moreover, that cases reported cured may, in years to come, develop a new carcinoma not in the site or region of the first operation, but in the remaining breast.

The second patient was operated upon by me for sarcoma of the breast 14 years ago, and during this time she has been free from all indications of this disease. One year ago she consulted me for some trouble in her remaining breast. While I was not positive as to the precise nature of this new trouble I advised an immediate removal of the breast, taking into consideration her previous clinical history. Professor Ewing states that this trouble in her second breast is a carcinoma, and not a sarcoma, as was the case in the first breast. We are here confronted with a peculiar history. A sarcoma in one breast, and after 14 years of supposed permanent cure, a malignant disease of another type altogether, develops in the second breast. The question naturally arises in this case, Was not the sarcoma cured, and was not the carcinoma in the other breast a purely incidental outbreak of a new disease, and wholly independent of the original disease from which she suffered 14 years ago, and from which she appeared to be cured? The more I study these cases the more I am convinced that our knowledge is still incomplete, and that much is to be learned as to the behavior of malignant disease in the individual case.

Third: That in the cases in which no return has been observed, the operation was performed almost without exception within 6 months from the incipiency of the disease, thus showing the great importance of early operation. This point seems to me of great importance in relation to the prognosis. I have examined my cases, and find that in nearly all of the permanent cures, the operation was performed within 6 months of the appearance of the disease. Too much importance can not be placed upon this fact; because it is without question that the earlier the operation the better the prospects of cure. This is true because glandular infection is not so likely to occur, and the patient is in better physical health, from absence of worry and pain. This fact should impress the family physician with the responsibility of referring his patient early to a surgeon, who then must assume the responsibility of this momentous question. No growth however small should be disregarded, especially if the patient is approaching the menopause. It is with a view to prophylaxis that the mortality of death from cancer of the breast is to be still further reduced.

In regard to the fourth clinical fact, the more radical the operation, within reasonable limits, the better the prognosis. It seems unnecessary and a loss of time, to discuss this point, since it

is universally admitted that the more radical the operation, the less likely it is that the disease will return. The difficulty seems to be as to what constitutes a radical operation. Surgeons agree that all skin over the infected area should be sacrificed. The breast, with Sir Astley Cooper's ligaments, should be entirely removed, together with the pectoral fascia and muscles; the axillary glands dissected out, and also the perimammary and retromammary fat, and the paramammary areolar tissue, as the minimum operation. If the cancer involves the ribs, and perforates the thoracic wall, and has already infected the mediastinal glands, no operation, however radical, would be attended with any success.

The same rule may also apply to that form of cancer termed *en cuirasse* or *en plaques*, or acute miliary carcinosis. I am firmly convinced that any radical operation, more than has been described, will be of no avail. The element of time should be seriously considered, since the performance of any operation which requires the patient to be under an anesthetic for 4 or 5 hours, is attended with a risk which should be if possible obviated. These prolonged operations are sometimes followed by either pneumonia, acute sepsis, profound shock, suppression of urine, and many other like conditions, which jeopardize the life of the patient. In other words we must not lose sight of some of the general principles connected with surgery, at the expense of the elaboration of an operation the performance of which eliminnates some of the best precepts and practices of our art.

Fifth: That in some cases in which the outlook was most unfavorable, as manifested by extensive ulceration, hemorrhage, wide-spread axilliary involvement, the end-results have been entirely satisfactory. No better proof of this statement can be made than by a brief reference to 2 cases occurring in the list of 50 cases. It seems pertinent to call attention to these 2 cases because they demonstrate the possibility of a cure when everything looks hopeless. I admit that we cannot place any reliance upon a cure when cases present such a chain of unfavorable symptoms. It only shows that surgeons should not withhold an operation from the patient, even when the outlook is most discouraging, if there is a possible chance; in any case the patients hould have the benefit of the doubt. It is always best, however; to explain to the friends the true situation, and then they will not be disappointed if the operation is attended with a quickly fatal result.

The first patient had a foul, ulcerating hemorrhage and fungus breast, with axillary enlargement. I advised the operation, not with the expectation of curing the disease, but purely from an humanitarian point of view. I felt sure that the hemorrhages could be in a large measure controlled; the offensive smell to a greater or less extent be removed; the constant pain, at least for a while, relieved; and, with a view to euthanasia, the patient might be made more comfortable while she lived. To my surprise after 8 years she has been free from the disease, and to all intents and purposes is at the present time in perfect health. The operation was radical, and I am at a loss to explain the cure under these conditions.

The second patient was the victim of a fungus, hemorrhagic, foul-smelling carcinoma of the breast. I hesitated to operate at all, but did so at the request of the husband, with a full understanding that the operation was one to palliate the distressing symptoms, and with no expectation of cure. This operation was performed 4 years ago, and to-day, to my utter astonishment, she is perfectly well and has no evidence of any return of her disease. Both of these tumors were examined by microscopists of world-wide reputation, who pronounced them carcinoma. I merely mention these two cases in the list of 50 to illustrate the fact that sometimes the most hopeless cases recover, and they appear to me to urge the surgeon to operate in the most desperate cases, with the most forlorn prognosis, provided the tumor is not adherent to the chest wall. I can offer no explanation as to the behavior of these 2 tumors, but they both seem to me worthy of record as evidence that our knowledge is still incomplete in regard to the course of certain types of cancer of the breast.

Finally, from a review and study of these 50 cases, it follows that surgery has made distinct advances in the cure of this most dreaded disease. It also follows that much is to be learned in regard to the accomplishment of a more uni-

form percentage of recoveries. It also is obvious that surgery must direct its attention to a study of the factors which influence the results of operative treatment. It is likewise evident that a greater unanimity of opinion must be arrived at by surgical pathologists whose work, in the histologic formation of cancer, is yet far from satisfactory, for one pathologist denominates a certain tumor cancerous, while another calls it by some other name. This leads to confusion and destroys the value of the results of operative treatment. The question of metastasis, too, demands more careful research as it is yet far from clear as to where the metastasis is likely to occur in the individual case. The tendency of certain benign breast tumors is not yet understood. The period of time as to what constitutes a permanent cure, following an operation, is not agreed upon by all surgeons. The radical character of the operation is admitted by all as the one essential factor in the operative treatment. This widespread discussion before this Association to-day should have an influence for good, on behalf of those suffering from cancer of the breast, and in years to come operative treatment in this department of surgery should give satisfactory and brilliant results.

RESECTION OF THE SOUND FEMUR IN GIGANTISM AND ASYMMETRY [1]

A Proposition

BY ROBERT W. JOHNSON, M. D., Baltimore, Maryland

IT is with a marked degree of hesitancy that the writer ventures to take the valuable time of this Society to present a proposition whose only virtues may be its novelty and brevity. As our commission calls on us to relieve pain as well as cure disease, this new idea may not be *ultra vires*.

No doubt most of you have observed that a woman over six feet in height is, more or less, an afflicted woman. She may enjoy perfect health and yet have not the same chance for average happiness as her sister of five feet seven, or even ten inches. In society she is more or less gawky, more or less handicapped by her height, and shunned by the average man, who hates to be looked down on. When she dances she towers over most of her partners and is a living picture of the caricatures of Thackeray, Du Maurier, or Gibson. She endeavors to meet this misfortune by stooping to conquer. Her shoulders fall and her neck cranes out. She recognizes that she is ostracized by her friends, beaten by a neck, until finally she settles down with a five-foot-three husband, if any, who has not sense enough to see how ridiculous they will appear together for the rest of their pilgrimage.

To put it mathematically, such a woman's chance for happiness is inversely in proportion to the square of the distance from her trochanters to her external condyle.

Occasionally there will be an empress born who can carry her magnificent height like a queen, and command the admiration and devotion of men of the same ilk, but I am thinking of the gawk one sees from time to time, especially in society, who is hopeless and impossible, largely because she is afflicted with height.

Now can nothing be done for their relief? These women suffer as much as bow-legged men — who have found help in McEwen — or broken-nosed women who look to paraffin as their savior. Nature has been holding out a helping hand for ages but surgeons have not grasped it. Every fracture of the thigh has told us that legs may be shortened and yet not lose their function. Now I do not propose subcutaneous fracture of the femur, because that is unscientific, inaccurate, and liable to

[1] Read before the American Surgical Association, May 7, 1907.

wound important structures; what I do propose is that after our patient has accepted the operation with a full knowledge of its possibilities, pro and con, we, under the most rigid asepsis, after careful constitutional building up, cut down on the femur at the junction of its middle and lower third, and from that region excise from 2 to 2½ inches from the shaft, then bring the proximal and distal ends together by chromicized catgut, silk, or silver wire, and having dressed the wound with or without catgut drain, encase the limb from pelvis to toe in plaster-of-Paris, or some fixed dressing, therein to remain until union has become firm. The bone may be cut square across at both ends or obliquely, or mortise-shaped ends may be made, though I am inclined to the square ends brought thoroughly together by the sutures, as less liable to necrose, and form a firmer support rather than the sliding of an oblique incision in the bone, or the manipulation involved in the mortise effect. Without infection such a limb should unite in from 8 to 10 weeks. After some 3 months, during which time the patient shall have recovered from Hospital confinement, the same may be repeated on the other leg with a like result. I do not advise the double operation at the same time, for in case of failure the patient's condition would be pitiable.

Again, in those cases of asymmetry, from whatever cause, when one leg is shorter than the other, when a limp or a high-soled shoe must equalize matters, as from hip-joint disease, fracture of thigh, or deformity, will not the patient be more comfortable with two even legs than with one shorter than the other? Is it not better to be an inch or two shorter than have the extra height half the time, if it means a hobble all the time? If your patient feels that he will take the risk of resection of the long sound thigh in order to bring about his comfort and usefulness, is it not fair to propose this operation, which under asepsis and good judgment should not offer much risk?

I shall not worry you with statistics or experiments. First, because I am making a new proposition and have no statistics except those of fractures of the thigh, with which you are familiar, and no animals with femora like men to experiment on.

I know, too, the very narrow margin between pathos and bathos in this proposition and thank you for your kind attention to my suggestion.

SOME CONSIDERATIONS IN REGARD TO BRAIN SURGERY[1]

By STEPHEN H. WEEKS, M. D., Portland, Maine

THE fact that the brain may be exposed for the removal of diseased parts, in appropriate cases, has made it necessary to ascertain the relation of its different fissures and convolutions to the cranial sutures, or to certain landmarks upon the surface of the head. The most important are the fissure of Rolando, fissure of Sylvius, and the parieto-occipital fissure.

The fissure of Rolando may be found in several ways, but the method I like the best, because I have made use of it for many years before my classes, is that of M. Lucas-Championnière. It is as follows: First find the bregma, that is, the spot where the coronal joins the sagittal suture, by carrying a line directly over the vertex from one external auditory meatus to the other. The upper end of the fissure of Rolando is situated about 2 inches behind the bregma. The lower end of the fissure corresponds to a spot 2¾ inches behind the external angular process, and about 1 inch above it. These 2 points are connected by a line drawn from the upper to the lower point. This line lies directly over the fissure of Rolando and is about 3¾ inches long. To find the fissure of Sylvius, lay down a base line from the lower margin of the orbit to the external auditory

[1] Read before the American Surgical Association, May 7, 1907.

meatus. Lay down a second line parallel to the base line from the external angular process of the frontal bone backward 1¼ inch, and then measure upward ¼ inch. This gives point one. Find the most prominent part of the parietal eminence, from it draw a line downward, perpendicular to the base line, and on this take a point ¾ of an inch below the eminence; this gives point two. Join these two points and the line will lie over the fissure of Sylvius. The fissure of Sylvius is about 4 inches long. To find the parieto-occipital fissure, continue the line of the fissure of Sylvius to the median line. At this junction lies the fissure. Since all areas now open to surgical operation can be located with a definite relation to these 3 fissures with the exception of the fissure of Bichat, described later, no further rules are necessary.

In order to get some data of value in regard to the motor area with relation to the fissure of Rolando, Drs. Mills and Frazier of Philadelphia made an analysis of the results of faradic applications in 25 cases, these including, as nearly as they could determine, 138 applications. It is probable that the whole number of applications, made in the 25 cases, was somewhat larger than is given, but the results of the tabulation and analysis can be relied on as accurate in their teachings. It is evident that the data are overwhelmingly in favor of the views that the motor region is in front of the fissure of Rolando. These results correspond closely with those of Sir Victor Horsley. An interesting practical matter, in connection with the question of centre movements of the head and eyes, is that which is brought up by the fact which several observers have noted as the result of human cortical faradization, that movements of the head sometimes take place toward the side on which the application is made. A case of Jacksonian epilepsy was recently reported in which the spasm began in the upper extremity of one side, the head turning during the convulsive attack toward the other side. The problem involved in these apparently contradictory observations as to the movements of the head and eyes, is one which must receive further careful consideration.

There are two essential preliminaries to any operation on the brain. The first is the diagnosis of the nature of the disease which is present, and the second is the diagnosis of its location.

A careful study of the various symptoms, of the order and manner of their development, and of the general history of the case, will usually lead to a diagnosis of the nature of the disease present. It should be constantly borne in mind that surgical interference is not warranted in any case, unless the nature of the disease is well determined. The second essential preliminary to operation is a knowledge of those facts regarding the localization of brain functions — so far as they are at present determined — which may lead to a correct diagnosis of the location of the disease. There are certain areas upon the cortex of the brain whose functions are accurately known. The areas are: (1) The sensori-motor area; (2) the speech areas; (3) the visual area; (4) the auditory area; (5) the area of sensation of smell and taste.

The sensori-motor area includes the cortex of the anterior and posterior central convolutions which border the fissure of Rolando, and the adjacent cortex in front (chiefly in front) and behind this fissure. Each hemisphere controls movements on the opposite side of the body, but as the right hand is more generally used, and is better trained than the left, this area is larger on the left hemisphere than on the right. The cortex of the posterior part of the second frontal convolution controls the movements of the eyes and head. Impulses starting from this point produce conjugate movements of these parts toward the opposite side.

The eye district is below; the head district above. The lower third of the anterior and posterior central convolutions governs the movements of the face, tongue, larynx, and pharynx. The eyebrows and cheeks are controlled by the upper and forward part of the area; the tongue and larynx by the lower and forward part; the mouth, pharynx and platysma by the hinder part.

The middle third of the anterior and posterior central convolutions controls the motions of the upper extremity; the shoulder motions being controlled by the anterior and upper part of this area, the elbow motions by its middle part, and the hands and finger motion by its

posterior and lower part. The upper third of the anterior and posterior central convolutions controls the motions of the lower extremity; the thigh, knee, foot, and toes being governed by various parts of this area, from before backward in the order named. It will be noticed that the parts susceptible of the finest and most delicate movements, those directed by the most acute sensations, the lips, the fingers and toes, lie farthest back in the motor area chiefly in the posterior central convolutions. Lesions in this convolution almost always cause some loss of tactile sensation as well as paralysis, and hence this area is thought to be the seat of tactile sensations as well as of movements, while some cases point to the localization of muscular sensations in the area just behind that of motion.

There are no sharply defined sections of the motor area to be assigned to special motions. Each motion, each part of a limb, has a wide general representation over the cortex, and a special representation at a limited area. Sir Victor Horsley says that the areas of representation of different limbs merge into one another; thus in the representation of the thumb we find that there is a focus, but that the thumb is represented over a great deal of the upper limb region, and that this representation diminishes in intensity gradually as we pass the focus upward. This explains the fact that the excision of a small area does not totally paralyze the portion of the thumb represented chiefly on that area. The adjacent areas represent to some extent that limb and hence can govern it if need be.

The speech areas are of four kinds and in four locations. They are limited to the left hemisphere in right-handed persons and to the right hemisphere in left-handed persons. There is the motor speech area in the posterior part of the third frontal convolution, in which the movements concerned in the act of speaking are controlled. The use of languages and the power of talking are affected when this region is destroyed. There is the auditory speech area in the first and second temporal convolutions, in which the memories of words are stored up. The understanding of language, and the power of recollecting the names of objects, are lost when this region is destroyed. There is the visual speech area in the lower parietal region in which the memories of printed words are stored up. The understanding of written language and the power to read are lost when this region is destroyed. The power of writing is a part of speech, and is usually lost when the motor speech area is destroyed, but its exact location is not fully determined, some cases pointing to the second frontal convolution, others to the lower parietal convolution near the hand centre as its probable cortical position.

The area of sensation of sight is located in the occipital lobe of the brain, including the cuneus on the median surface, and the occipital convolutions on the convexity. The cortex lying in the calcarine fissure is the part primarily reached by the visual impulses, but the parts named are also concerned in vision. Each occipital lobe receives impressions from one half of both eyes, hence a lesion in one lobe produces hemianopsia — a half blindness in both eyes, the blind field of vision being on the opposite side of the lesion.

The area of sensation of sound is located in the first and second temporal convolutions of the brain. Each ear is connected with both hemispheres, hence deafness from a unilateral lesion is only partial, and is not generally noticed. But if both temporal lobes are destroyed the patient becomes totally deaf.

The area of sensations of smell and taste is located at the tip of the temporal lobe on its under and inner surface, which rests on the sphenoid bone. Each lobe is related to sensory organs on both sides, and a unilateral lesion does not often produce noticeable symptoms.

There are large areas of the cortex of the brain whose function is undetermined. These are much more extensive on the right hemisphere than on the left. There are no definite symptoms produced, so far as we know, by lesion in these areas; but the negative fact is certain, that lesions in them do not cause disturbances of motion, of sensation, or of speech.

There appears to be a certain relation between the frontal lobes of the brain and the higher forms of intellectual activity — the powers of fixing the attention, and of reasoning, and of self-control. But disease here does not

cause a loss of any one mental faculty, and for the higher power of the mind a general integrity of the entire brain, not of any one part, is necessary.

The cortex of the hemispheres upon the base of the brain, lying on the orbital plate, on the sphenoid and temporal bones, and on the tentorium cerebelli, has as yet no assignable functions, and lesions in these regions do not produce recognizable symptoms. As to the functions of the centrum ovale, it is known that through this region the great brain tracts pass in various directions. Many of these connect the various areas of the cortex with their respective sensory or motor mechanisms in the base of the brain and spinal cord. Others join the different areas of the cortex with each other, thus bringing about a combination of sensory impressions into a single mental image. Others again unite the two hemispheres of the brain with one another, it being certain that symmetrical areas must act in unison on the two sides. The basal ganglia, the corpora striata, and the optic thalami, lying deep within the hemispheres, are masses of gray matter whose function is undetermined.

Lesions in them frequently affect the various tracts which pass between them in the internal capsule, thus cutting off afferent or efferent impulses to and from the cortex, and causing sensory and motor symptoms of the nature of hemianesthesia, hemianopsia, and hemiplegia.

But if disease in the ganglia does not invade the internal capsule it cannot be detected during life. The crura cerebri, pons, and medulla, contain the centres of the various cranial nerve nuclei, and hence cranial nerve palsies are caused by disease in them. They transmit motor and sensory impressions to the spinal cord, hence numerous symptoms appear when they are injured. The cerebellum, lying in the posterior cranial fossæ, beneath the tentorium cerebelli, controls the equilibrium of the body; hence disturbances of the nature of staggering and vertigo are produced by lesions affecting it, especially if its median lobe is involved.

These local symptoms of brain disease must form the chief guides to the physician in his diagnosis, and to the surgeon in operations. When they are present they point to a particular area of the organ which must be involved; when they are absent both neurologist and surgeon are as helpless as they were before any of these facts of localization were determined.

CASES OPEN TO OPERATION

There are many cases in which it is evident that brain disease is present but in which it cannot be located, because the necessary symptoms to determine its location are absent.

There are other cases in which it is evident that the disease is located deep within the hemispheres, or on the base of the brain, entirely beyond the reach of the surgeon. It is therefore evident that in only a limited number of cases of brain disease can operative interference be considered with favor. Operations may be performed for the relief of Jacksonian epilepsy, for the cure of imbecility, for the removal of clots, for the opening of abscesses, for the excision of tumors, for the relief of intracranial pressure, with or without drainage of the lateral ventricles, and for the cure of traumatic insanity.

It has always been recognized, and always will be recognized, that the majority of cerebral tumors are both impossible to find and impossible to cure. All these observations maye be true when applied to tumors of the brain, but a much better prognosis may be given in cases of cysts of the brain. After drainage or removal of these cysts the epileptic and other symptoms, local and general, and paralysis, are not infrequently recovered from.

The following is a case in point:

Mr. E. A. H., aged 59, gives the following history. His spasmodic trouble began sometime in November, 1892. He was standing in a grassy place when the right foot became numb, in a moment the muscles of the leg began to twitch, then those of the thigh, then those of the groin; while the spasm lasted the whole leg danced and he could not hold it still. This twitching of the muscles was attended with very severe lancinating pains. When the spasm stopped he fell to the ground, faint from the pain. It was difficult to estimate the time but he thinks it lasted 2 or 3 minutes, more or less.

In about twenty minutes there was a recurrence, but far less severe. From this time on until the operation in May, 1898, these spasms continued about every 10 days with a recurrence, usually the next day, with the exception of some 6 weeks when he first came under my treatment, in 1892. Large doses of bromide of potassium seemed to have some controlling influence for a few weeks. In June, 1894, the attacks became more violent, and are thus described by his wife: He became

unconscious and remained so for some time, should say an hour or more, throwing himself from the couch to the floor, moaning and frothing at the mouth, his whole body twitching and writhing as if in great agony, his face and hands purple to blackness, his teeth set, eyes rolled into his head; at the last fell into a quiet sleep which lasted only for a short time, awoke conscious and epileptic symptoms disappeared. From this time on there was a gradual decrease in the pain and in the twitching of the muscles and a steady loss of their control.

He could not tell when he first noticed the extension of the spasms to the hands, probably early in 1897, possibly earlier. Soon it affected the lips and eyes. For a long time before the operation he could not read neither could he write because he could not control his hand. He had so lost control of his leg that he could not tell where it was unless he was looking at it. He was also sensible that his mind was affected and could not trust himself to do any business, in fact he became so helpless that his wife was obliged to dress him. He was, indeed, in a helpless, and to all appearances a hopeless condition.

Operation. On May 27, 1898, I operated on Mr. H. at the Maine General Hospital. An opening was made with the trephine over the leg area on left side in front of the fissures of Rolando; this was enlarged upward, downward, and forward, with the rongeur forceps, until a large surface of the brain was exposed. The dura was much thickened and firmly adherent to the inner surface of the skull. There was no pulsation of the brain. The dura was opened and beneath it was a large cyst filled with a thin fluid. The fluid was evacuated, and a gauze drain placed in the cavity; no attempt was made to suture the dura. The scalp wound was closed, leaving room for drainage. The patient made rapid and uninterrupted recovery from the operation. After leaving the hospital he continued to improve and in November, 1901, I received from him the following letter:

LITCHFIELD CORNER, ME., Nov. 6, 1901.

My dear Dr. Weeks:

I have had in mind for a long time to send you some word as to my condition, for I am fully persuaded of my great obligation to your skill and kindness, and I know that you have a very great interest in my case. In general there has been a gradual, steady improvement since the operation. Spasms have become irregular and lighter, nearly painless. Have steadily become normal in use of right hand and leg. The same is true as to mind and language. A year ago last spring I began the canvass of Windham for the Bible Society. Began by working every other day, and rode. I grew stronger and began to walk and so continued from town to town until January. I was then invited to preach in this place for two weeks, and have been here ever since.

There is a slight dragging of the right foot so that I limp a little ordinarily in walking. But have no discomfort in walking off three or four miles or even twice that without stopping. And the exercise seems good for me. What I call "the spasms" are irregular, from one to six weeks apart. If I am lying down or sitting, I do not usually notice it until the hand is affected. If walking or standing, I am aware of a defect in the control of the leg. When it reaches the hand, there is a numbness in the fingers, and a slight sense of the drawing of the cords. This sometimes passes off quickly, sometimes comes and goes for perhaps fifteen minutes. Rarely, nowadays, the lips on one side are affected for a few moments, and the eyes. All symptoms occured last Sunday morning while I was delivering the sermon. It has not occurred before since I came here, and I was able to continue the service as usual. This kind of spasm is followed by a peculiar headache, not severe but extremely depressing, which continues until after a night's sleep. It is proper for me to say that I am very happy in this work here, in spite of an assurance that my ability to continue it is extremely uncertain. Once more I wish to thank you with all my heart for giving me, under God, this new lease of service.

Cordially yours,

E. A. H.

Since November 6, 1901, I have continued my work as a pastor. I continue to be subject to the spasms occasionally, sometimes two or three in a week, sometimes free from them for twelve weeks. My hand and leg are not normal but they serve me very well, and the spasmodic action seems to harm my mind or ability to work but very little. My general health is very good for one in his seventy-second year.

In October, 1906, Mr. H. came to see me and I found his condition good. He is able to continue his preaching.

The question of anesthesia during operation on the brain is a very important one. In all of my operations on the brain I have used ether as an anesthetic. I have never made use of intraspinal injection of cocaine. My experience has been confined to general anesthesia. Intraspinal anesthesia is of too limited applicability, because control of the intensity of narcosis is lost. While in London last year I found Sir Victor Horsley using chloroform only. He claims that ether causes, besides a rise of blood pressure, a notable increase of blood venosity, and therefore much additional and troublesome hemorrhage. In its later effects, that is on recovery, it causes excitement, as well as in many cases notable headache and, of course, vomiting.

Chloroform, on the contrary, causes a fall of blood pressure with relatively less blood venosity, although this is by no means absent. It, therefore, does not aggravate the bleeding, nor embarass the respiration by causing bronchorrhea. By its more essentially paralyzing

action on nerve centres it causes practically no after excitement but moderate headache. Chloroform is more dangerous, although the danger is much less when administered according to the plan made use of at the National Hospital, Queen Square, London.

At the National Hospital, Sir Victor Horsley uses almost wholly Mr. Vernon Harcourt's apparatus, by which chloroform can be used in known quantities. It has been found that less than 2 per cent of chloroform vapor in the atmosphere breathed by a patient, is enough to produce deep narcosis, and that a much smaller dose is required to maintain unconsciousness to pain.

If the mouth of the inhaler be made to fit by wet aseptic towels, the amount of the dose given will be under complete control. With a dose commencing at 0.5 per cent, and rising in 1 or 2 minutes to 2 per cent, the patient ought to be ready for operation after 5 or 8 minutes. As a rule the amount of 2 per cent is given for about 5 minutes before the incision of the skin and reflection of the flap, which constitutes the maximal pain period of the operation. This completed, the dose can be lowered, by pushing the tap back, and the bone removed at 1 per cent. As the dura is a sensitive membrane, supplied by the fifth cranial nerve, the dose should be somewhat raised just previous to its incision to prevent reflex starts or movements on the part of the patient. As soon as the dura is opened the encephalon can be dealt with without causing much, if any, pain. Consequently all this part of the operation is done under less than 0.5 per cent of chloroform in the air respired, an amount which, of course, is far below that required in the first stage of the operation. After the brain lesion is dealt with the percentage should be raised to about 0.7, or even to 1 per cent, during the insertion of the sutures in the skin. This percentage is continued to the commencement of the dressing to prevent vomiting.

In all operations on the brain it is important to prevent, as far forth as possible, the loss of blood. To this end it is necessary that every bleeding artery should be secured by ligature, and on this point we cannot too strongly emphasize the advice of Von Bergmann, that it is very unsafe to trust to tampon pressure. It is remarkably easy to arrest capillary oozing and arteriole oozing from the brain by the simple means of hot irrigation. To quote the words of Dr. Milne Murry, who from his experiments came to the following conclusion: "It is certain that water from 70° to 103° or 105° F, will invariably dilate blood-vessels and promote the flow from open ones, but it is equally certain that water of temperature from 110° to 120° F, will have just the opposite effect. The temperature of the fluid should not exceed 115° F, and should not fall below 110° F. If a large irrigator be used, it is an easy thing to keep the fluid at the desired temperature on account of its mass, and it is gratifying to see the oozing gradually cease during the steady flow from the irrigator "hose" pipe."

It is, I think, to Sir Victor Horsely that we are indebted for the idea of using oxygen, in connection with chloroform, to control venous and capillary oozing. During the administration of chloroform there is gradually induced a moderate degree of asphyxia which has the effect of raising the venous pressure. The fact is plain, and consequently all that is to be done to lower the venous pressure and stop the oozing is to get rid of the asphyxial condition. Says Sir Victor Horsley, "Though it is impossible to improve promptly the action of the respiratory centre itself directly, or the respiratory movements of the patient and so lower the venous pressure, it is easy to raise the percentage of oxygen in the anesthetic atmosphere breathed, by directing a stream of gas through the air inlet of the Harcourt regulator and so quickly abolish any asphyxia. It is interesting to see how rapidly the bleeding stops as the color of the oozing blood changes from dark purple to a bright scarlet." This arrangement is in use at the National Hospital, Queens Square, London, for anesthetization and oxygenation of the patient. The Veronn Harcourt regulator is fixed in the conical stand, the chloroform bottle being in a water bath. The oxygen supply from the horizontal cylinder is readily regulated by the anesthetist. Prof. Theodor Kocher, of Berne, stands at the right of the photograph.

An important question arises, namely, When should medical treatment be given up and surgical treatment substituted? The same ques-

tion was raised again and again, and warmly discussed in connection with appendicitis, until now the profession is pretty well agreed that appendicitis is surgical from the first. When our powers of diagnosis become more perfected, surgical treatment of the various diseases of the brain will not be considered a "last resort." At the International Medical Congress, held in Berlin in 1890, Sir Victor Horsley proposed that in cases of Jacksonian epilepsy, and other syndrometa which suggested the existence of grosser organic disease of the brain, a definite probationary period of medical treatment should be agreed upon, and that in an elementary case, where no urgent symptoms like optic neuritis existed, surgical treatment should be employed after thorough drug medication had been energetically applied for about 6 or 8 weeks and cure had not appreciably resulted.

Dr. Allen Starr, in his well-known work on *Brain Surgery*, formulated the conclusion that the surgeon should be invited to consultation in the case after about 3 months medical treatment had been unsuccessful. Such a course is, in general, the practice at the National Hospital, Queens Square, London. In 1906, Sir Victor Horsley was asked to operate on a patient with lateral tumor of the cerebellum, who had been known to have optic neuritis for 9 years, and did operate on such a patient who had been known to have optic neuritis for 13 years.

Intracranial disease is liable to produce optic neuritis, which usually ends in total blindness. It is now well settled that optic neuritis is due to the intracranial tension, and is amenable to surgical treatment. In no case of optic neuritis should the process be allowed to continue after it has once been diagnosed, and if blindness results therefrom the responsibility is very heavy on anyone who fails to advise such a simple proceeding as opening the dura mater.

Touching the subject of the neuritis I quote from a paper by Sir Victor Horsley, read at the meeting of the British Medical Association, held in Toronto, August 21 to 25, 1906. "The gravity of this responsibility does not seem to be generally recognized, and it is owing to this, as well as the backward state of neurologic diagnosis, that melancholy cases such as the following occur. A. B., lady, married, developed symptoms of cerebral tumor with acute optic neuritis, and was told by a neurologist that nothing could be done, surgically. Subsequently, after some treatment with iodides, the neuritis subsided into complete atrophy and blindness, while the cerebral lesion gradually retrogressed. When the patient came under my observation in the spring of this year, her physical condition was apparently perfectly normal except the permanent loss of sight. This calamity would have been wholly avoided by operating to relieve the optic neuritis, even if nothing further had been attempted to deal with the lesion itself."

To sum up, then. During the past 20 years we have learned that although the old procedure of de Vicker, of incising the swollen sheath of the optic nerve in the orbit is of no avail, we can with certainty avert blindness by opening the subdural space early, in cases of intracranial disease; preferably in the basal temporal region of the right side, that is, assuming that no attempt is made to attack the disease itself. One other fissure should be mentioned, the fissure of Bichat pointed out by Broca. This fissure is between the cerebrum and the cerebellum, and corresponds to a line drawn from the external occipital protuberance to the external auditory meatus and marks the position and direction of the lateral sinus. In operations on the cerebellum, the opening must be made below this line. Tumors of the brain, collected by Starr and various other authors, show that in order of frequency they stand about as follows: Tubercular gumma, glioma, cysts, carcinoma, syphilitic gumma, with a small proportion of fibroma. In all probability gummata, either of tubercular or syphilitic nature, are much more frequent than all the other varieties put together.

Until within a few years tumors within the cranium were regarded as having great pathologic interest, as affording opportunity for brilliant diagnosis, but, as so essentially hopeless that but little attention has been given to this feature of the therapeutics or operative relief. Interest in the subject was increased by discoveries in the field of cerebral localization, and as the result of greater exactness in diagnosis and greater experience in experi-

mental surgery upon the lower animals, and by more experience in operative surgery upon the human subject, it has been found that a certain proportion of them are amenable to surgical treatment, with a reasonable degree of success and safety. The brain is no longer a terra incognita, nor is it now a sanctum which none may enter or explore.

There is good reason to believe that with greater accuracy of anatomic and physiologic knowledge, which shall permit more accurate localization of lesions, we may go further with success than we have yet dared to go. In all operations on the brain every precaution should be taken to protect the patients against shock. Shock and sepsis are practically the only causes of death which can be provided against during surgical operations. In 1893, at the discussion in the surgical lecture of the British Medical Association at Newcastle, Sir Victor Horsley pointed out that the early statistics of intracranial operations showed that the majority of deaths occured from a severe degree of shock, which could be in great part avoided by dividing the operation into two stages, the interval between them being about 5 days. The first stage consisted of the opening of the skull, the second, of opening the dura mater and the removal of the lesion. On the same occasion he also called attention to the fact that although at the second stage the dura mater was opened, the removal of the tumor was often attended by relatively little shock. Subsequent experience has fully confirmed these statements, and shown that it is in fact the opening of the skull which causes most general depression of nerve energy, and greatest alteration of the circulation.

Sepsis is another cause of death which should be guarded against during and after surgical operation on the brain. It has always been recognized, and long before Lord Lister's immortal discovery of antiseptics explained why, that the cavities of the body presented special risk to septic infection. Nowadays, when many surgeons can show an unbroken record of successful operations for the radical cure of hernia, or for appendicitis in the quiescent stage, I believe it is not fully realized how very different should be our estimate of the susceptibility of the central nervous system to invasion by septic microörganisms, and of the extremely feeble degree of its resisting powers. With these important facts in view the surgeon should use every possible precaution to protect his patient from this danger. In all operations requiring drainage, it should be remembered that so long as the cerebrospinal fluid continues to escape, the most vigorous disinfection of the skin, and frequent changing of the dressing, must be carried out, for not only so long as the cerebrospinal fluid is flowing is there great danger of septic invasion, but the difficulty of closing a drainage is increased the longer the cerebrospinal fluid passes through it. Says Sir Victor Horsley, "I feel inclined to reassert the view, expressed in 1906, that the less drainage is employed the better, and consequently that every effort should be made to close the skin wound as early as possible."

CONCLUSIONS

1. There are two essential preliminaries to any operation on the brain. The first, is the diagnosis of the nature of the disease which is present. And the second, is the diagnosis of its location.

2. The most important landmarks upon the surface of the head, by which certain motor and sensory areas are determined, are the fissure of Rolando, fissure of Sylvius, the parieto-occipital fissure, and the fissure of Bichat.

3. It has been determined, by recent experiments and observations, that the motor area is largely in front of the fissure of Rolando, and the sensory area is largely behind this fissure.

4. Each hemisphere controls movements on the opposite side of the body, but as the right hand is more generally used and is better trained than the left, this area is larger on the left hemisphere than on the right. The speech areas are limited to the left hemisphere in right-handed persons, and to the right hemisphere in left-handed persons. The speech areas are of four kinds: The motor speech area; the auditory speech area; the visual speech area; and the power of writing, which is a part of speech and is usually lost when the motor speech area is destroyed, but its exact location is not fully determined.

5. Operations may be performed for the

relief of Jasksonian epilepsy, for the cure of imbecility, for the removal of clots, for the opening of abscesses, for the excision of tumors, for the relief of intracranial pressure, with or without drainage of the lateral ventricles, and for the cure of traumatic insanity.

6. Tumors of the brain, collected by Starr and other authors, show that in order of frequency they stand about as follows: Tubercular gumma; glioma; cysts; carcinoma; syphilitic gumma, with a small proportion of fibroma. In all probabilities gummata, either of tubercular or syphlitic nature, are much more frequent than all the other varieties put together.

7. The question of anesthesia in brain operation is a very important one. My experience has been limited to general anesthesia. I have never made use of intraspinal injection of cocaine. Sir Victor Horsley uses chloroform altogether. He claims that ether causes, besides a rise of blood pressure, a notable increase of blood venosity, and therefore much additional and troublesome hemorrhage. Chloroform, on the contrary, causes a fall of blood pressure with less blood venosity. Sir Victor uses Mr. Vernon Harcourt's apparatus, by which the chloroform can be used in known quantities. The dose can be regulated by the movement of a hand or tap. During the administration of chloroform there is generally induced a moderate degree of asphyxia which has the effect of raising the venous pressure, with an increase of oozing of blood. To relieve the asphyxia which causes the oozing, a stream of oxygen gas is directed through the air inlet of the Harcourt regulator which quickly relieves the asphyxia. The oozing of blood quickly stops as the color changes from dark purple to a bright scarlet.

8. Intracranial disease is liable to produce optic neuritis which usually ends in total blindness. The optic neuritis is due to intracranial tension and is amenable to surgical treatment. In no case of optic neuritis should the process be allowed to continue after it has been diagnosed. Blindness can be averted by opening the subdural space early in cases of intracranial disease. This operation can best be done in the basal temporal region of the right side, assuming that no attempt is made to attack the disease itself.

9. Shock may be in great part avoided by dividing the operation into two stages, the interval between them being about five days.

10. To avoid the danger of septic invasion, which is greater in operations on the brain and spinal cord than in operations involving the abdominal cavity, the less drainage is employed the better, and consequently every effort should be made to close the skin wound as early as possible.

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THE DIVERTICULUM ILEI AS A CAUSE OF COMPLETE INTESTINAL OBSTRUCTION IN A MANNER HITHERTO UNDESCRIBED[1]

By FREDERIC HENRY GERRISH, M. D., LL. D., Portland, Maine.

COLLECTIVE investigation of the surgical bearings of the diverticulum ilei has been recently made with so much care as to render superfluous, at this time, a review of the main subject. Abdominal crises, due to misbehavior of the diverticulum, are not, however, so frequent that they have ceased to attract attention, either on account of the way in which they cause trouble, or the necessity which they occasion for surgical interference; and it seems to be a duty to report all such cases in the hope that light, at present conspicuously lacking, may be thrown upon their diagnosis without resort to abdominal section. The purpose of this paper is to report a case in which the diverticulum established such relations with neighboring parts, as to cause complete obstruction of the intestinal tube — a rather common effect of diverticular eccentricity — but did this in a manner, which, as far as I have been able to learn, is perfectly unique.

On March 23, 1906, I went to Freedom, N. H., by invitation of Dr. G. W. Lougee, to see the case. The patient was a vigorous male, 20 years old. For 4 days he had had no defecation, although previously there had been no recognized intestinal difficulty. Cathartics had been administered until they were found to be worse than useless. Many enemata had been given with no result, except that the last one brought away a little mucus, slightly tinged with blood. The pulse was of good quality, the temperature substantially normal, and the moral tone of the patient excellent. Examination of the belly showed that the large intestine was empty; the small considerably, but not extremely, distended. The opinion was expressed that there was complete obstruction near the lower end of the ileum; but I was unable to make a closer diagnosis. I confess that the possibility of the real cause did not occur to me.

The abdomen was opened in the right linea semilunaris. The obstruction was readily found at about 50 cm. from the ileo-cecal junction. The intestine proximal to this point was distended and highly congested; the distal portion was empty, shriveled, and very pale, with a bluish tint. The occlusion was caused by the passage of a diverticulum from right to left through an arched opening in the attached border of the mesentery, and its retention in this abnormal situation by a prolongation of its free end into a slender cord, which extended ventrocaudally to the anterior abdominal wall. The precise point of attachment of this cord was not determined, as it broke on gentle manipulation, and the practical needs of the patient so engaged my attention subsequently that this detail was slighted.

The diverticulum was not adherent to the intestine, and was easily withdrawn from the mesenteric opening. Immediately it and the distal part of the ileum assumed the appearance of the proximal portion, becoming equally distended and of a deep red color. The diverticulum was nearly 10 cm. long, and its diameter was equal to that of the bowel from the free border of which it sprung. It was manifestly unsafe to trust so erratic an organ in the abdomen in view of the vicious tendencies of its kind; and, therefore, I clamped its base with a long hemostatic forceps — placing the blades in line with the longitudinal axis of the bowel — cut it off, sewed the stump with a continuous stitch of chromicized catgut, which included all the coats, concealed the pedicle by depressing it into the lumen of the intestine, and retained it there with a Cushing suture. As the appendix was easily reached, and could be rapidly ablated, it, also, was removed. The abdominal wound was closed without drainage. The subsequent history of the case was so typically satisfactory, that its details need not be rehearsed.

I do not undertake to explain the production of this very peculiar relation of the diverticulum to the adjacent parts. That it was of recent origin seems unlikely, considering its prolongation to the abdominal wall

[1] Read before the American Surgical Association, May 7, 1907.

by a fibrous cord — a condition that obtains in a noticeable, though not exactly ascertained, proportion of cases in which a diverticulum is present. But, if this vestigial organ had been in this extraordinary situation for a long time, one is puzzled to understand why it did not cause some appreciable trouble from the beginning of its predicament, especially considering the suddenness of the attack and the completeness of the constriction of the intestine.

With our present knowledge it is impossible to distinguish cases of obstruction, which are due in some way to a diverticulum, from those depending upon some other causes. Statistics show that the mortality of operations in diverticular cases is very high — a result clearly due to delay in the resort to surgical help. Porter, in his admirable paper,[2] probably does not state the case too strongly in saying that, in proportion to the frequency of its presence, the diverticulum ilei is one of the most pregnant sources of grave abdominal difficulty, and that it is a greater menace to life than an appendix vermiformis. The diverticulum should be removed whenever discovered, unless the condition of the patient forbids the additional risk that its ablation involves. In the latter case the patient should be informed of the existence of the diverticulum, and instructed to invoke competent surgical help on the appearance of any trouble such as can fairly be attributed to this mischievous vestige of the embryonic state.

PROSTATECTOMY[1]

BY ARCHIBALD MACLAREN, M. D., ST. PAUL, MINNESOTA

At the meeting of the American Medical Association last year at Boston, there happened to be no paper on the surgical program on the subject of prostatectomy. The remark that prostatectomy had evidently run its course, made by a number of our best surgeons, but by men who had done little, if any work, along these lines, caused me to elect this subject several months ago. Since that time two excellent works have appeared, one by Young, in the Johns Hopkins Hospital reports, dealing with perineal prostatectomy according to his well-known method; the other by Deaver in a beautiful volume, taking up in an exceptionally thorough manner all sides of this interesting subject. We have here in these two books the extremes; for Young practically always removes the prostate through the perineum, while Deaver, although he recognizes the occasional value of the perineal route, always uses the suprapubic operation of Freyer.

Several years ago Murphy, with his keen surgical judgment, in discussing this subject took the position that both operations had their legitimate field; that when the prostate projected more into the bladder than it did into the perineum the suprapubic route was the best; that when the prostatic enlargement could be well defined by a rectal examination, the perineal route was the operation of choice. Charles Mayo believes that in a stout man, with a thick perineum and a long prostatic urethra, with a high-lying prostate, that either the suprapubic or the combined operation is indicated.

The excellent results obtained by such men as Young and Deaver, Mayo, Goodfellow, and many others, make us feel that both operations have been established on a firm and lasting foundation; that they have proven their value; and will always hold their places in the surgical world of the future.

For several years I made the suprapubic operation with excellent results. Some of the cases bled profusely and had to be packed; a few, especially the old debilitated men, had

[2] "Abdominal Crises Caused by Meckel's Diverticulum." By Miles F. Porter, M. D., of Fort Wayne, Indiana. J. Am. Med. Ass., 23, Sept., 1905.

[1] Read before the American Surgical Association, May 8, 1907.

infections of the prevesical space, endangering their lives and prolonging their convalescence. These bad cases did better when they had a perineal drain, therefore it seemed best to make the drainage opening first and explore the bladder from below; then if it seemed easier and safer to remove the prostate from above, we could later make a suprapubic opening. In following this method I have been in the habit of making a median perineal incision, opening the prostatic urethra, and, after exploring the bladder with the finger, have usually found that I could remove the prostate through the prostatic urethra, even when it was of considerable size, and even when the enlargement was principally confined to the median lobe.

Since adopting this method of perineal exploration I have met with very few cases which could not be successfully removed through the perineal wound. This procedure, is, as a rule, easily and quickly accomplished. The difficult ones usually prove to be the hard fibrous prostates that have suffered from prostatitis perhaps for several years. The hard fibrous prostates are always difficult to remove whatever be the route of attack. Freyer describes one which he could not remove through the suprapubic wound and had to abandon on account of the profuse hemorrhage, the patient dying in the next few hours in shock. As Deaver says,"This result is far from proving that the prostate, in this individual patient, could have been satisfactorily removed by a perineal operation, but it certainly shows that no one method can be exclusively employed, if we aim to secure the best results."

After exploring the bladder with the finger, which grows longer with experience, as Moore has so well pointed out, withdraw the finger into the prostatic urethra and pass into the urethra a sharp-pointed, short-bladed bistoury and, with the finger as a guide, make a slit one inch long in the side wall of the prostatic urethra, cutting deep enough to be certain that the capsule is well divided. After entering the capsule of the prostate, whether from above or from below the enucleation of a lobe, is not very different from the separation of an adherent appendage, after one has his finger in the line of cleavage, or perhaps it is more like the enucleation of a fibroid in a myomectomy. Sometimes it requires considerable force to remove a fibrous prostate. But some of my very best results, as far as urination and ability to have intercourse were concerned, have been in just this class of cases.

Young does the same thing with his much greater and more extensive dissection, only he divides the posterior wall of the prostatic capsule while most other operators, myself among the number, work from the inside, dividing only the urethra. Deaver seems to think that Goodfellow divide the base of the bladder, but I am inclined to think that he follows the same line that I have just described.

My objection to Young's method is that too much anatomy is exposed, and that whatever the method of removal — whether by perineal or suprapubic route — the actual work of enucleation has to be done by the sense of feeling alone, and after entering the line of cleavage the sense of feeling is all that is necessary. Again the posterior prostatic sheath and rectum are so intimately united, that it needs the greatest care to avoid injuring the rectum in attempting to separate one from the other, while it is almost impossible to injure it when working from the inside of the prostatic capsule.

I speak from one sad experience. After I had been doing prostatectomy first by the suprapubic route and later by perineum, for several years, I read Young's description, saw his beautiful plates, and I said to myself, " that is much the best method." On my first and only attempt I opened the rectum. I ought not to have done it, and believe that I would not do it again, but I have been afraid to try it a second time. The theoretical value of saving the ejaculatory ducts in these old men, is, I believe, not a sufficient reason for exposing them to the considerable risk of a rectal fistula.

Young has had so much experience and has done his operation so many times that with him the risk of this accident is now very small but with the rest of us, who have not had the advantage of his experience (8 per cent in 50 cases), the danger, considering the great disability which this accident occasions, makes us hesitate, and keep to the median prostatic operation for the majority of cases, with the suprapubic for exceptional ones. Bellefield, who is a strong advocate of the suprapubic

route says, in the *Illinois Medical and Surgical Journal*, that rectal fistula occurs in 8 per cent of 2,000 reported cases of perineal prostatectomy — permanant incontinence in 3 per cent, stricture in 7 per cent, mortality from 3 to 5 per cent — and that with any but the median incision there is apt to be a loss of erectile power, not from the loss of the prostate but from the destruction of the perineal muscles. He thinks that there is 20 per cent of chances that the patient will find himself worse off after the operation than he was before.

I have not found this true in my own cases, perhaps they have gone to someone else. I know of two cases operated upon by other men but good operators, one of whom would certainly be dead at this time if he had not had his prostatectomy. The other probably would have died. Both are very miserable from a suppurating cavity at the neck of the bladder. One, who following a suprapubic operation had a later cystitis, has refused to have another suprapubic exploration, and I have operated upon him twice through the perineum with only temporary results. The other man I have never seen, but from the description given me, has apparently the same condition following a perineal prostatectomy. He is being constantly irrigated by a friend of mine, in the hope that he may not have to have a second operation. Bellefield finds that the mortality of the suprapubic operation is twice as great as the perineal operation, but thinks that the risk is justified on account of the greater chance of a perfect cure. Murphy thinks that the mortality of the two operations is about equal. Bellefield advises when making the suprapubic operation that, to avoid infection of the prævesical space, either a 2-stage procedure, 5 days apart, or draining of the wound through the triangular ligament and perineum.

After doing the suprapubic operation for several years with excellent results, I made a suprapubic cystotomy for a stone, on a boy 22 years old, with apparently a clean bladder. This was just after the modern suprapubic operation was described, and I carefully made the opening in the bladder water-tight, about the suprapubic tube, with a purse-string suture. The wound did not do well, and I eventually did everything but drain the boy from below, but in five weeks he died with a small contracted bladder, deep in the pelvis, and a huge abscess filling the entire pelvis above it. This experience has always been in mind when considering the best method of reaching any diseased bladder, and has influenced me more than any other one thing to favor the perineal line of attack.

Young's operation for cancer of the prostate is without doubt the best operation so far offered. I have only operated upon 2 cancer cases, one of whom lived over 3 years after a removal according to his method.

There is a small class of patients, which we should always keep in mind, that is, the neurotics. As prostatectomy becomes better known among the laity, this class increases in number, just as in the surgery of the stomach the neurotics are the first to make the diagnosis of their own cases and apply for relief. If they are truly neurotics, operation gives no relief at all. One such case has recently come under my observation. A weak old man of excessively nervous character came to me desiring prostatectomy. He had no cystitis, as evidenced by examination of the urine, but he had attacks of frequent painful urination — as often as every hour during the night, for several months — without much enlargement of the prostate. He had marked dyspnea at this time without any evidence that I could discover of pulmonary or cardiac disease. I referred him to my friend Dr. Charles Greene, who found arteriosclerosis. Fortunately I did not operate, but saw him on and off for several months. Recently he died very suddenly of heart disease, his bladder having been considerably improved by internal medical treatment.

The patient suffering from an enlarged prostate often can be very much relieved by intelligent use of the catheter. He should be carefully instructed in the care of it. I have known several cases that have safely used a catheter once or twice a day for several years. Sooner or later the bladder becomes infected and usually this is the time that the surgeon first sees the case. I have known several cases so badly injured at the time of the first retention, by the heroic and hysterical abuse of the catheter by the medical man, that the patient was killed as a result. If the patient objects

to the use of the catheter, I usually encourage him to have his prostate removed. The danger of the operation upon a clean case, is very small, while the danger to an infected case is very much greater. As a class, "Prostaticks" are the most satisfactory of any in surgery, especially the bad cases, the ones who have used a catheter until the breakdown of catheter life. They have become disgusted with themselves, have been in torment, and I know of no class who are so much pleased as are these old men when they find that they can again urinate naturally.

Young believes, after a careful study of 145 cases, that gonorrhea is not an active factor in the production of prostatic hypertrophy, and he only found 8 strictures in all of these cases, before operation.

In regard to the symptoms, pain seems to be rather a common one—pain usually situated in the perineum, especially in calculous cases and several that I have seen have suffered from painful nocturnal erections.

I have noted hematuria in a number of cases, sometimes in the early stage of the disease, in others later in its course. Complete retention of urine has been the first symptom complained of in 20 per cent of my cases. The frequency of urination has been the most common symptom complained of in over 50 per cent of cases, urination about every hour during the day and every 2 hours during the night. Cystoscopy has not been at all satisfactory in cases where this was tried, and I agree with Deaver in believing that there is more danger of doing harm with the cystoscope than there is of a chance of acquiring useful information by its use.

In the last 25 prostatectomies there has been one death. This man was 75 years of age, a patient of Dr. Kilbride's of Canby, Minnesota, —a weak, thin emaciated old man, with a temperature of 105° and suffering from frequent chills. I watched him several days and saw that he was going to die if he did not get some surgical relief. Under these circumstances I always feel that if I were the patient, I would want the surgeon to assume his part of the risk. So at his request I operated upon him to find that he had a large glandular adenomatous prostate which shelled out easily from the perineum. Two large stones were then removed through the same wound. He lived 7 days to die of exhaustion. At the autopsy an old double pyelitis was found, the kidneys being almost completely destroyed.

CONGENITAL DISLOCATION OF THE HIPS[1]

By OSCAR H. ALLIS, M. D.
Surgeon to the Presbyterian Hospital, Philadelphia

THE term congenital is open to criticism. It is too comprehensive; it embraces every condition that presents itself at the moment of birth.

The intra-uterine term of existence is not merely one long term of nine months duration — but, physiologically considered, consists of two stages, as distinct from each other as the building of an engine, and the management and care of it after it is built. The initial period of intra-uterine existence is the constructive period. It is properly designated by the term embryonic, and is the rudimentary stage of existence; speaking generally, it embraces the first month and a half of utero-gestation. During this time the master-builder, from an amorphous vivified cell, must construct a perfect miniature human being. During this, the embryonic period, he must construct a framework — joints, ligaments, muscles — vascular, nervous, nutritive systems; clothe each with its respective garments, and at the *time limit*, namely, at the end of six weeks, hand over his work to his successor.

The initial, embryonic, constructive stage cannot be too carefully considered, nor its importance overestimated. Just who the presiding genius of construction is, where he resides, how he manages his cordon of master-workmen, how the countless processes of construction move on without clash or interference, but in perfect harmony, are matters that do not concern us; but that there is such a chief presiding master-spirit, ruling with a firm, exact, intelligent influence cannot be doubted.

If all goes well a perfect being will be formed and punctually, at the completion of the time limit, the master-genius resigns his charge to his successor.

But all may not go well. The artist to whom was intrusted the construction of the mouth and lips may take offence, throw up his half-completed work, and the master-builder, unable to induce him by threats or bribes to resume his work, is obliged to hand it over to his successor, marred, unfinished, incomplete.

The second stage of intra-uterine management is presided over by a genius of a very different order. Hers is not the bold, resolute, venturesome work of the builder, hers is the gentle fostering care of the mother; hers to take the tiny miniature being and nurse it until it is strong enough to enter upon an independent existence; hers is to take whatever is handed over to her care, no matter what its defects. If a being with extrophy of the bladder, imperforate anus, bifid spine, eyeless, earless, armless, is put under her charge, hers is to feed and nourish it with a mother's tenderness. She has no power, no skill — if she cared to do so — to take up the imperfect, unfinished work of her predecessor and complete the lips or give sight to the eye.

The abandoned, unfinished work of the embryonic stage is often spoken of as "arrest of development." This is certainly true and no better term could be employed if the same term were not used in describing fetal, that is, post-embryonic conditions. If a child were born at full term, with a hand or foot withered or distorted, while the other hand or foot was plump and fully developed, the former might properly be designated an arrest of development; but if the withered hand or foot were covered with skin, if the digits were all tipped with nails, if each member had its full quota of joints, tendons, muscles, the so-called "arrest of development" must be assigned to a period subsequent to the embryonic. During the fetal period accidents and diseases may attack the new being, but blotches, bruises, broken bones, and withered limbs, belong to a different period, arise from different causes, and are amenable to different remedies than the defects and deficiencies of the embryonic period.

I have made the assertion that the defects, the deficiencies, the arrests in the constructive stage of the embryo, are not repaired during the probationary term, but appear at birth just as

[1] Read before the American Surgical Association, May 7, 1907.

they are left at the conclusion of the embryonic time limit. I now go further and say that all *embryonic deficiencies are incapable of completion.* The surgeon can patch up a harelip, he can drain a kidney into an intestine in case of exstrophy of the bladder, and finally close up the front of the belly wall, but he has supplied no deficiency. No matter how deftly he repair the harelip, a smile, a laugh, will expose his awkwardness and deride his skill.

The reader may think that I have delayed unnecessarily long in emphasizing the two periods of intra-uterine existence, but my reason for doing so will be clear when I state that authors and teachers upon this subject refer the so-called congenital dislocations to the embryonic stage, and go so far as to state that in some instances the hips were never in their sockets, as no sockets ever existed. If no sockets were formed and no femoral heads and necks, then certainly these defects are properly referable to the embryonic stage. But here a most inexplicable dilemma arises, for the same authors and teachers who claim that the dislocation is an embryonic defect, also claim that such cases are capable of perfect recovery. It remains, therefore, for them to show why the hip-joint should be the only embryonic defect that is capable of complete repair, or to acknowledge that the so-called congenital dislocations are *post-embryonic* defects.

The statistics in regard to congenital dislocations present many interesting and instructive features. One of the most arresting and puzzling of these is, that nearly nine tenths of the cases occur among girls. Dislocations of this particular type have been noticed for centuries, and for centuries the relative proportion between the sexes has been the same. That which militates strongly against its being an embryonic defect is, that the victims are usually so fair, well-nourished, and well-proportioned, that not a suspicion of any congenital defect arises until the infant makes its first attempts at walking.

As I have denied the possibility of so-called congenital dislocations being of embryonic origin, so now I deny the reasonableness of the oft-repeated assertion that there is an abnormal relation between the sockets and the heads of the femurs; that the latter grow too rapidly, and soon become too large for the shallow and scanty sockets, and hence are forced out of them; or that disease attacks the sockets and in the course of its progress forces the head from its normal position — all these assumptions are mere gratuities and one answer will serve for them all. If they are the result of disease *in utero* — a disproportioned development — by what logic is the surgeon to assume that a post-natal reduction will restore the parts to normal physiologic conditions; and if disease and asymmetry of development is the cause, why should it involve the hips more than the shoulders, or girls more frequently than boys?

As a possible solution of the origin of congenital dislocations it has been suggested that they may occur during birth processes; that a deformed pelvis or abnormal position, or the manipulations of the accoucheur, may be responsible for the defect. But here again I urge the well-known fact that male children are larger at birth than female, and if the foregoing theory be correct, then the greater frequency of congenital dislocation should be found in male children.

Another theory that the dislocation may be due to fetal muscular action has been advanced. Against this theory it may be urged that auto-dislocations can scarcely be conceived of prior to the fifth month — when the mother recognizes the active movements of the child — and the same arguments hold true that if due to muscular action the male child, which is larger and stronger, should present the defects with greatest frequency.

No writer with whom I am acquainted has ventured to assert that congenital dislocations occur under perfectly normal conditions, and are due to the application of forces that under similar conditions produce dislocation in later years. Nor has any one ventured to explain why congential dislocations are so much more frequent in females than in males. The views put forth and supported in this article are that *congenital dislocations are traumatisms; that they are due to uterine contractions, and occur during the birth processes.*

For a dislocation to occur under normal conditions two factors are necessary: First, there must be adequate *force*, and, second the force

must be applied in the position calculated to effect the result.

First, as to the requisite force. This we have in the uterine contractions. It is during the processes of the birth act that the danger to the uterus itself is most imminent. It is during the stage of active labor that the womb — prodigiously augmented in size and strength, ripe for the climax of its great function, and stimulated by the restless energetic action of the fetus — puts forth its supreme effort. The strength of uterine contractions have been variously estimated, but I have no desire to quote them, suffice it to say that only to the pregnant uterus, and only in the birth act, and at no other time, and under no other conditions, is rupture of the uterus possible. Rupture of the uterus, with extrusion of its contents in whole or in part into the abdominal cavity, is fortunately not a frequent accident, but sufficiently so to occasion no surprise. *Here then we have a force sufficient to produce a dislocation of the hips* and it only remains to show how such a force can accomplish such an end.

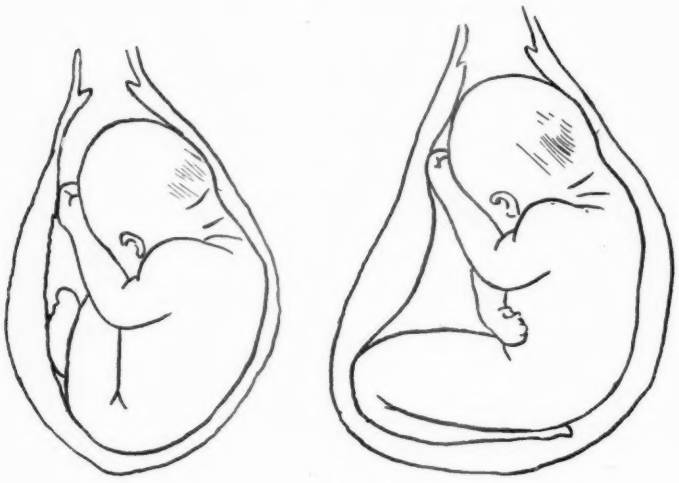
One of the arguments, and possibly the most influential, urged against the possibility of traumatic dislocations from uterine contrac- is that the limbs of the fetus cannot be made to assume a position that would make dislocation from uterine contractions possible. This theory is based upon the teachings of Sir Astley Cooper and accepted by his long lines of followers, namely, that dorsal dislocations are due to force applied in the long axis of the limb, when it is extended upon the trunk. Such a position cannot be assumed *in utero* and, were the theory sound, the arguments against the possibility of dislocations from uterine contractions, within the uterus — that is, during birth processes — would be conclusive and unassailable. But the theory of Sir Astley Cooper is unsound. His theory that dislocations take place when the femur is extended cannot be verified in experimental work — and if not impossible is extremely improbable — while dislocations of the flexed femur are easy of accomplishment.

In experimental work upon the adult cadaver, with the femurs flexed to a right angle with the trunk, dislocation is possible and easy of accomplishment, without injury to any part of the bony pelvis; but attempts to dislocate the hips in the extended position, with force exerted in the long axes of the femurs, will be followed by fracture of the rim of the socket, of the socket itself, or the pelvis, or some part of the shaft or neck of the femur. In the extended position the rim of the socket, which receives the brunt of the attack, is strongest and deepest, the socket has its greatest depth, and the portion of the capsule that covers the head is the strongest part.

All this is reversed when the femurs are flexed to a right angle with the trunk. Under these circumstances the head of the femur can be forced from the socket without injury to the bony parts. With appropriate apparatus I have repeatedly dislocated both thighs in the adult cadaver, simultaneously, by means of force applied to the knees flexed at right angles to the trunk. I am well aware that there is not a close analogy between uterine contractions upon a fetus in the birth act, and force applied to the flexed knees of the adult cadaver through powerful levers, but the conditions are sufficiently analogous to suggest, to an unprejudiced mind, that the flexed position is a possible and not, as declared by the opponents of the theory, an impossible one for dislocations.

MECHANISM OF DISLOCATION OF THE HIPS THROUGH UTERINE CONTRACTIONS

Let us imagine the relations of the uterine content to the uterine container. The latter is a symmetrical muscular structure, rudely pear-shaped. Transverse sections would approximate the circle; longitudinal sections that of an egg. To such an enclosure the uterine content must accommodate itself. The head must be bent forward on the chest, the vertebral column arched backward, the thighs flexed upon the abdomen, and the legs flexed upon the thighs (Fig. 1). While the uterus is in repose there would be no undue pressure upon its content, but during the birth act uterine contractions, sometimes uniform and symmetrical, sometimes partial or unequal, alternating with periods of uterine relaxation, may present conditions favorable for catching the knees of the half-born child (Fig. 2) at right angles to the trunk, and in a position that I have found experimentally to be the most favorable



Figs. 1 and 2.

to effect dislocation of both hips at the same instant.

But the possibility of dislocation from uterine contractions does not explain why congenital dislocations are relatively so much more frequent among female children; and to this point I feel that we have an argument in the size and weight of the sexes at birth. Statistics show that male children are longer, larger, and heavier, than female. If, now, we assume that the female pelvis at birth is as wide as that of the male, we will see that pressure applied to the knees in the female (Fig. 3) will be applied more obliquely than to the male, from the fact that the femurs of the female are shorter than those of the males, and this obliquity is highly favorable to dislocations from pressure. When I have dislocated single hips, by means of leverage and direct pressure, I have found it much easier to do so in a state of adduction (Fig. 5, *c c.*) than when the force was applied perpendicularly, as in Fig. 5, *a b.* To the foregoing reason, purely a mechanical one, do I attribute the greater frequency of dislocations of the hips in female children.

Again it will be said that were this a recent traumatism, the new-born child would manifest it by crying out with pain, but what infant at birth does not cry out lustily? Indeed if it does not the accoucheur generally spanks it until it does. Further, it is alledged that if the hips were dislocated the attending physician would notice the deformity; but not if the limbs were moderately flexed on the belly, and who ever attended a birth process that did not see the new-born infant with flexed or semiflexed limbs? Indeed, I have seen a nurse often strenuously resisted, and her efforts to apply the diaper impeded, by the strongly flexed thighs of the new-born child. Congenital dislocations of the hips are infrequent and hence never looked for. Where is the physician that ever discovered an imperforate anus? This is as frequent as congenital dislocations yet no physician ever detected one at birth. It is owing to the fact that the diaper remains unsoiled that attracts the attention of the nurse to possibility of something wrong.

There is a question that presents itself in this connection and should not be passed, namely, that occasionally a child will be found with a single dorsal dislocation; and still rarer with a dislocation on the inner plane of the pelvis. In experimental work, when attempting to dislocate both hips simultaneously, I have not infrequently dislocated but one; and this has suggested the answer to the first query, namely, that the uterine contractions may catch only a single knee or, even catching both, the conditions may change the instant one hip is dis-

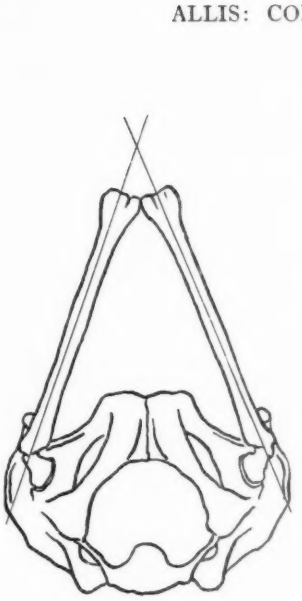


Fig. 3.

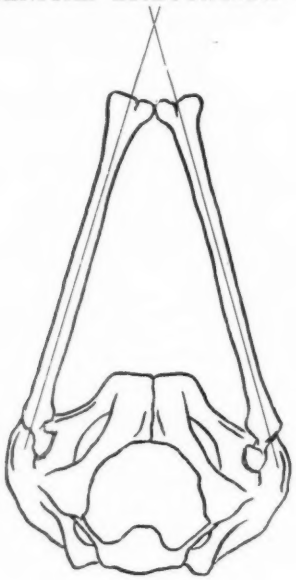


Fig. 4.

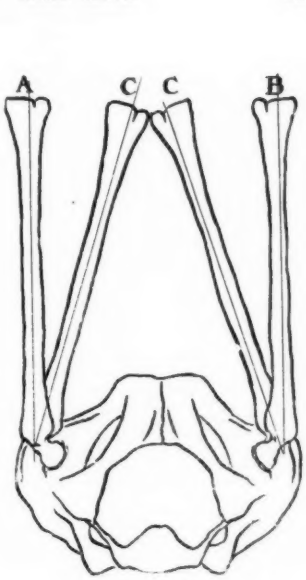


Fig. 5.

lodged and with its dislodgement contractions may cease and the other hip escape. Even when both have been dislocated I believe the manipulations of the nurse may restore a recently dislocated hip to its socket. In washing the nates, and putting on the diaper, she will flex both hips (Fig. 6) even lifting the after parts of the child from her lap; she may then forcibly separate them (Fig. 7) to get the diaper between the limbs, and then press down the knees (Fig. 8). These manipulations are precisely the same that a surgeon would follow were he intending to restore a dislocation of the hip. In clinical efforts to restore a hip, by measures similar to that just described, a dorsal dislocation has been converted into an inward or thyroid, and this may account for the occasional dislocation inward of the congenital

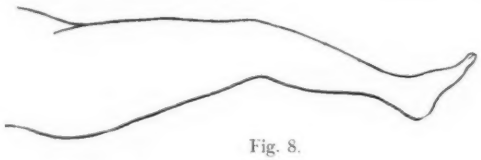


Fig. 8.

Fig. 6.

Fig. 7.

variety. I cannot conceive it possible for the thigh to be flexed and abducted — two essentials for the production of an inward dislocation — while the thighs of the fetus are still within the uterine cavity.

The fact that no inconsiderable number of congenital dislocations are unilateral — the second hip being sound and perfect — militates against the theory of embryonic defect or disease or muscular action of the fetus, since it is hardly probable that a single hip would be involved as an embryonic deficiency, or as the result of intra-uterine disease, or accident, while the remainder of the entire construction was perfect.

The pathology of this affection is now being enriched by the observation of many careful workers, but as few children with congenital dislocation die at birth, the profession will wait a long time to get reliable information upon this head. The older writers met with a few scattering cases in pathologic museums and in dissecting rooms, and from these made deductions that largely influenced the medical profession in the treatment of this affection. I have examined a number of these specimens and find quite a uniform condition in the changes produced in the pelvis, the most important of which is the uniform shrivelled, shallow, somewhat triangular, condition of the acetabulum. The changes in the head and neck of the femur are less uniform. These may be classified as follows:

1. Those in which the head of the femur is entirely absent with scarce a trace of a neck.
2. Those where the head is flat like a button.
3. Those where the head is undeveloped but moderately round, or slightly facetted.

Here we have three distinct, clearly defined, markedly dissimilar, conditions, all of which are susceptible of explanations upon the theory I have advanced; namely, that congenital dislocations are traumatisms, and occur as the result of uterine contractions in the processes of labor.

I will take up the three pathologic conditions in the order given:

1. *Cases in which there is no head or neck, in which the shaft of the femur ends, apparently, in the great trochanter.* It is this class especially that has given rise to the belief that there never was either head or socket. In this class I am of the opinion that there never was a true dislocation but that the uterine contractions (Fig. 2) broke the neck of the femur, or, what is practically the same thing, separated the head from the neck, leaving the head in the socket and driving the trochanteric end of the shaft outward and downward as in a dislocation. This suggestion, as an explanation of the pathologic condition referred to, is derived from experimental work. I have never been able to dislocate the femur of a full-term fetus — my efforts invariably separated the shaft and neck from the epiphysial head. Were such an accident to take place, the child, when it reached the age for walking, would present all the symptoms of congenital dislocation. The little spur of a neck would gradually shrink, atrophy, and disappear, and the shaft end in the great trochanter. The child would walk supported mainly by the untorn parts of the capsule, precisely as it does in congenital dislocation.

2. *Cases in which the head is flat like a button.* In this class of cases the head is probably forced through a rent in the capsule, bringing it directly against the bony wall of the ileum where it is to make a new socket. As the head is entirely outside of the capsule there is nothing to compel it to retain a globular-spherical form, and when the child begins to walk the head becomes flattened like a silver dollar against the dorsum of the ilium.

3. *Cases where the head is undeveloped but moderately round or slightly facetted.* In this class the head, though driven from the socket, retained its relations to an unruptured capsule; hence the head always had its sheath or capsule, and was controlled as in a sling. As it no longer had a properly fitting socket, the movements of the child compelled the head of the femur to move upon uneven surfaces, and hence the irregularities or facets.

The fact that I have never been able, after repeated efforts, to dislocate a hip at birth might lead to the conclusion that it could not be done *in utero*, but the conditions are greatly altered. My own efforts were made through rotation, and this is unlike the intra-uterine procedure. Again dislocation through pressure on the flexed knees, if done *in utero*, gives

the infant pelvis a strong well-fitting base of resistance (Fig. 2), which would make dislocation possible without injury to the pelvis, while attempts to dislocate the hips through vertical pressure *after birth* cannot be so favorably entertained.

Prognoses, if dislocation is permitted to remain unrestored. Upon this head it is hardly necessary to say more than that the unfortunate victims are handicapped for all the active duties of life. While the affection is not painful it is crippling, and the gait renders the person awkward and conspicuous. No female with congenital dislocation of the hips should marry, as her only hope of issue must be through Cæsarian section. Every case of congenital dislocation, that has attained to puberty and walked from infancy, has too narrow an antero-posterior diameter of the pelvis to admit of safe parturition, and all such pregnant cases, should fall into the hands of experienced laparotomists.

The diagnosis of this affection deserves careful consideration from every practitioner of medicine. This is especially important, for it is not infrequently the assurance of the family physician that there is nothing the matter, that leads the anxious mother to dismiss her fears. I make this statement from no small experience. As a rule the mother will notice that the child does not walk right. Under such circumstances it should be stripped absolutely naked and permitted to walk up and down the room. The most notable sign in double dislocation is the protuberant belly and the forward-arched lumbar vertebra. Both of these signs are due to the same defect, namely, the position of the heads of the femurs posterior to the socket. This compels the child to throw its shoulders well back to preserve the centre of gravity. As the tendon of the psoas muscle is dragged unduly backward this muscle will tend to drag the lumbar vertebræ forward.

In double dislocations the trunk of the child will be apparently lengthened while the limbs are correspondingly shortened. As the child walks there will be a noticeable limp if only one hip is out, but a swaggering loose-jointed gait if double. If the examiner's hands are placed over the hips while the child walks, the trochanters will seem loose and wabbly.

For the critical examination the child should be placed naked upon a perfectly flat surface—a bed or cushioned lounge is not reliable—flat on its back, and both knees should be pressed down upon the table. If this is accompanied with decided arching of the spine it will be due to the same cause referred to in the erect posture (Fig. 9). Most reliable information can be

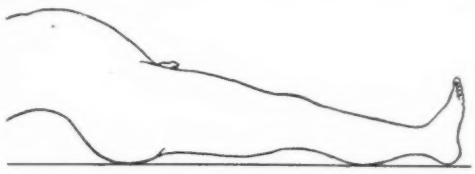


Fig. 9.

obtained by comparing the knees, when flexed at a right angle with the trunk. Under normal conditions the femur equals in length the combined length of the tibia and tarsus, that is, the distance from the knee-joints to the socket of the hip, is about equal to that from the knee to the sole of the foot.

Fig. 10 shows femurs flexed at right angles to trunk, hips normal, and soles of feet on level with the sockets and above the level of the table. Figs. 11 and 12 show right hip dislocated, femurs perpendicular, head of dislocated hip rests on level of the table, foot also rests on table, sound knee and foot are correspondingly above the knee and foot of the dislocated one.

It is confirmative of the above symptoms if the head of the femur can be readily made to shift its position. If dorsally dislocated, the the child recumbent, the pelvis resting upon the operator's hand, the femur can be flexed and extended, raised or depressed, and the head will be felt to move. In comparing the lengths of the femurs, if one or both are dislocated, the pushing up of one and drawing down of the other will show discrepancies that will not be possible in normal thighs. Finally if there be doubt the X-ray will settle the question, and bring out the condition of the head and neck, and furnish much information relative to the outcome of treatment.

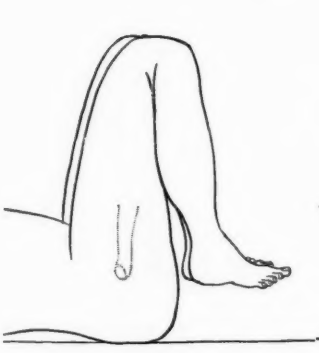


Fig. 10.

Fig. 11.

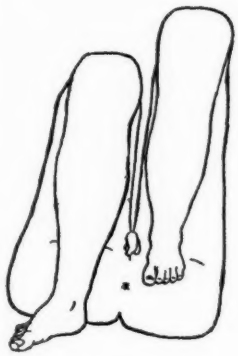


Fig. 12.

TREATMENT

Open surgical Methods. These are now generally reserved for cases that have resisted milder measures and, fortunately, are not of frequent occurence.

Reduction by Manipulation — The Lorenz Method. This is popularly known as "the bloodless method." It consists of extreme manipulations in which all constricting bands are overcome, prior to attempts at reduction. After anesthesia the thigh is hyperflexed until the toe can be made to touch the ear; then hyperextended to the extreme limit of safety, even endangering the femoral vessels; then flexed to a perpendicular and abducted. Abduction brings the adductor muscles into prominence and these are ruptured by forced abduction with one hand abducting the knee, and with the thumb of the other hand pressing on the tense tendons as they appear in the groin. When the hyperabduction is complete the knee lies at a lower level than the pelvis, and in an absolutely helpless condition — all this preliminary to any attempt at reduction.

To effect reduction an assistant makes extension by traction upon the ankle in the long axis of the body, while counter extension is made through a perineal band, carried above the head and shoulders, and fastened to a staple or entrusted to assistants. Professor Lorenz took his seat by the side of the child and, grasping the thighs and pelvis, brought direct pressure against the trochanter by means of his thumbs. Reduction was announced by the sudden passage of the head from an outward to an inward position. If the head resisted the efforts at reduction the traction upon the thigh was varied, and if reduction was still impossible the thigh was again submitted to hyperflexion, hyperextension, and hyperabduction.

Having replaced the hips the next step was to apply a retentive apparatus. This was by no means the least interesting and instructive part of the demonstration. The child with thighs flexed and abducted to, or even below, the horizontal was placed with the sacrum resting on a specially devised stool. The pelvis and thighs were then entirely enveloped in cotton and the entire pelvis and thighs encased in plaster-of-Paris. As the plaster was hardening it was cut away from the perineum and belly,

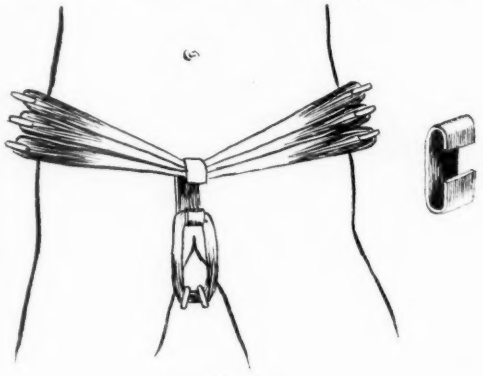


Fig. 13.

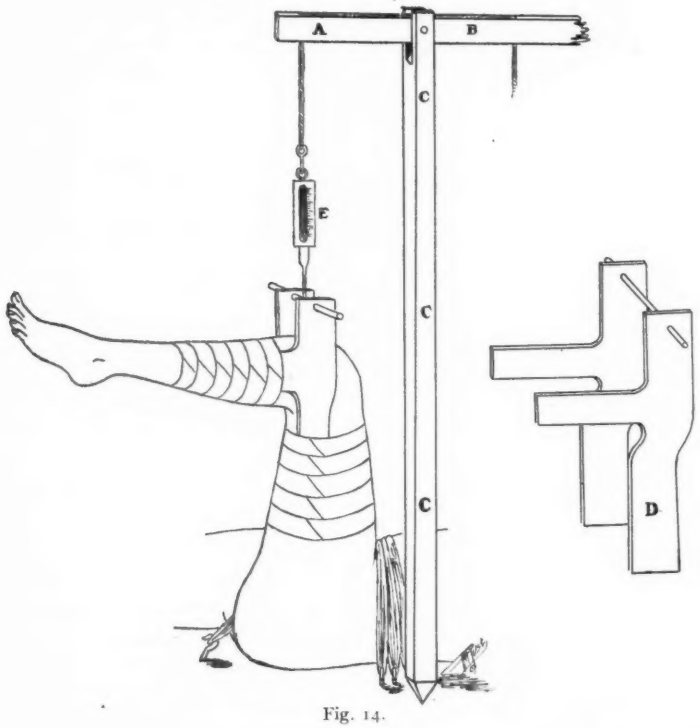


Fig. 14.

leaving sufficient above the pubes to bind the cast in front.

The advantages of this dressing are many. As it is applied by the surgeon he is alone responsible for its effectiveness. It affords an easy vehicle for transporting the child and, as it is to be retained without change for five or six months, the pains taken in its application are fully rewarded.

REDUCTION BY MANIPULATION — PRELIMINARY VERTICAL TRACTION

After full anesthesia the pelvis of the child is firmly secured to the table by means of bandages, and hooks placed at the perineum and sides of the pelvis, Fig. 13. To prevent the bandages from interfering with the free manipulation of the hips, they are passed over a bent piece of iron as represented in Fig. 14. After securing the pelvis to the table, angle irons, Fig. 14, *D*, are secured to the thigh and leg; this done vertical traction through a lever is made Fig. 14, *A B C*, for the length of time deemed desirable. With the spring balance *E* between the short arm of the lever and the angle irons attached to the limb, the exact amount of traction can be seen. Traction from 20 to 30 pounds may be made for from 15 minutes to half an hour, after which the lever is detached and an effort made to replace the dislocated femur. This is done by seizing the thigh with the right hand, and lifting it upwards until the head of the femur is on a level with the socket, and then making abduction against the thumb of the left hand, pressing against the great trochanter. The ease with which reduction is often accomplished, the entire absence of shock, the favorable condition the following day, all contrast strongly with the conditions I had witnessed in the reductions effected by Professor Lorenz. In the apparatus used, the long fulcrum *C C C*, Fig. 14, whose base is near the pelvis, and which is parallel with the femur, permits of every motion that is desired

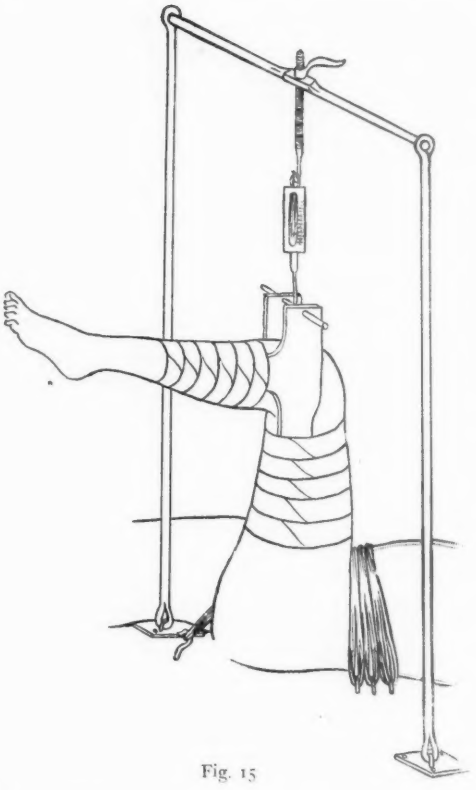


Fig. 15

in applying traction. Thus one is able to lift perpendicularly, abduct, adduct, flex, extend, circumduct, and rotate, all the time gently increasing the traction with a knowledge of the amount of traction being used.

I employed pelvic fixation and the lever, for the first time, in the hospital of Jefferson Medical College in the presence of Professors Gross and Brinton, Doctors Levis, Hearn, Barton, and others, in 1884, in efforts to reduce a recent dislocation in an adult, but I never thought of employing them in congenital dislocations until after witnessing the method of Professor Lorenz. Congenital dislocations are necessarily chronic and necessarily attended with shortening of certain structures — muscles, tendons, ligaments, and fascia — which must be stretched, ruptured, or divided. I have never heard the reasons that induced Professor Lorenz to resort to rupture, in preference to division of tendons subcutaneously; but I imagine that when he began his work he resorted to the tenotome and finding that after he had divided the most prominent tendons he was still baffled, he was obliged to resort to force to overcome the remaining obstacles. Hence he dropped the tenotome and employed only rupture; and in his demonstrations in Philadelphia, at Jefferson Medical College, he ruptured every structure that opposed the freest, widest latitude of motion before he made a single effort at reduction.

What Professor Lorenz accomplished by rupture I have accomplished without traumatism with the lever. As already said the long fulcrum enabled me to circumduct the limb so as to put traction upon resisting structures from all directions. But experience soon taught me that the long fulcrum rendered my lever somewhat uncontrollable and suggested two horizontal fulcra as represented in Fig. 15. This still further differs from the first as it substitutes the screw for the lever. In children under three years a force of 30 pounds kept up for 15 minutes will often be sufficient, but in older children the traction force has been carried to 100 pounds.

There is another point that I feel is worthy of mention, and that is the difference in the methods of reduction. Professor Lorenz employed *horizontal* traction. With the ankle in the hands of a powerful experienced assistant, the head of the femur was brought down to a point opposite the socket and then by an effort that to the onlookers seemed to call forth all the operator's strength, the head was forced from the outer plane, into a position corresponding to the normal relations. That such a procedure would drive a portion of the capsule before the head seemed to me unavoidable, at least in a certain number of cases, but whether it did or did not the method adopted was the same in all cases. In the method I have adopted I have resorted to no force in the actual reduction, and hence I could feel as the head passed over the division, between the two planes of the pelvis, that it had entered a depression simulating the normal socket.

Professor Lorenz puts his cases immediately in plaster-of-Paris and does not remove the

first dressing for six months. A second plaster dressing is then applied, with the thighs slightly adducted, and flexed to a position approximating extension. This is worn four months more, after which there is no further plaster dressing.

During the ten months of plaster encasement the child is allowed every rational privilege. It can sit in chairs devised for the purpose, it can be carried about by nurse or mother, and in certain cases, locomotion is enjoyed by the little captive.

In my first case I adhered closely to the teaching of Professor Lorenz, but found, that with all possible care, the dressing was very irksome in the hot days of summer. The principle emphasized in the Lorenz dressing is sound, and cannot be departed from, namely, flexion and abduction and the primary dressing of plaster-of-Paris — sound and practical but as a dressing, after the first month, I think it objectionable. First, it does not permit that degree of cleanliness that is desirable. In a child, the entire body should be washed at least once a week, and this is obviously impossible while it is encased in plaster. But my most serious objection to plaster-of-Paris is that it does not permit any latitude of exercise. With the thighs flexed to a right angle, and horizontally abducted, there is scarcely a possibility of redislocation — but this is the only advantage — and the question arises, Cannot the child be placed in an apparatus that will allow it to use the limbs in an abducted position? I have advantageously employed such an apparatus, which gave the child the freest flexion and extension and which was so arranged that adduction was increasingly permitted. To accomplish this, however, I did not allow the child to sit up during the entire course of treatment. No hard and fast rules can be laid down, but, speaking generally, I would say that the child can be advantageously placed in plaster-of-Paris for a month; in an apparatus for six or eight months; and without apparatus for the balance of the year, but all this time it should be reclining. The advantage of the reclining posture is, that when the child is exercising its limbs there is no greater weight upon the newly constructed socket than that of the limb itself, and it is encouraging to the parents, and interesting to the child, to see the daily progress in the use of the limb in its new position. It will be objected that the child is kept on its back for an entire year; but when it is stated that it can have a daily bath if necessary, that it can be carried about from room to room and out in a carriage, the privation is materially mitigated.

It will be urged as in favor of the fixed plaster-of-Paris dressing that the child can even walk about, but it walks without using the hip joints. The plaster dressing immobilizes the hips; and, if there is motion in the joint, it is very limited and in very narrow range. The child may be able to walk about but it walks by the aid of the plaster cast not by the use of the new-formed joints. A year is short enough time to expect a good recovery, and the more of this year that the child can have for gaining the full range of motion of the hips the better; hence I adopt an apparatus that limits abduction but does not interfere with flexion and extension.

DEGREE OF SUCCESS

In two cases that I have had — both under three years — females, with only one hip dislocated, the recoveries have been, so far as ascertainable, perfect anatomic successes. It is only after a large experience that reliable data can be obtained, and one is not a little surprised to read that Professor Lorenz claimed only 50 per cent of perfect recoveries. It would be interesting, as well as profitable, if the reasons for failure in 50 per cent could be obtained. In attempting to account for the failures Müller quotes Lange who says that in certain cases there is a change in the relations of the head and neck of the femur to the shaft, that the angle is rendered more obtuse and the neck rotated upon the shaft. Adopting this view Müller asserts that in this class of cases the Lorenz reduction is not a veritable reduction but rather a shifting from one position to another, and the child recovers from a dorsal dislocation to give evidence of a forward intraspinous dislocation. Müller substantiates his theory by adopting a method of replacement suited to these cases, and claims recoveries that have baffled the Lorenz method. He even asserts that by adopting his method

the remaining 50 per cent of cases can be perfectly cured. For his method the reader is referred to reports of the American Medical Association held in Boston, 1906, Section of Surgery and Anatomy.

The large percentage of failures has elicited much speculation and investigation among surgeons. I shall not attempt a summary of them but content myself with two: First, the method of reduction; second, the mode of permanent dressing.

THE METHOD OF REDUCTION

This is through forced extension. It is the method of Sir Astley Cooper who believed that the only resistance to reduction lay in the muscles. Hence the great London surgeon resorted to emetics, the lancet, and having reduced his patient to the limit of exhaustion, applied compound pulleys. As he believed the dislocation occurred with the limb extended, he believed that extension in the long axis of the body was logical, and the only feasible method. Lorenz followed this theory to the letter, believing that muscular contractions have been the chief hindrance he tears every shortened muscle in two. He requires nothing but an anesthetic to render insensibility and relaxation complete. So much for the preparation. The reduction is not done by manipulation but by most strenuous exertion.

The traction is made from the ankle and often the efforts of a powerful assistant are baffled. The head is never *replaced*, it is rather *forced* into the socket, and this forced replacement is accountable for a portion of the failures. There can be no reasonable doubt that the capsular membrane is, at times, forced before the head, or that the rim of the socket is seriously damaged by such heroic measures; or that the capsule may be torn up from its capsular attachment and driven before the head.

THE MODE OF PERMANENT DRESSING

The plaster dressing is applied with the thighs flexed to a right angle and abducted *so that the knees lie at a point on a level with or below the sockets.* Fig. 16.

What are the possible conditions? The reduction may have been happily accomplished and everything favorable, but in this extreme abduction the head is not in the bed of the socket but pried out of it by the neck resting on the rim of the acetabulum. Under the most favorable circumstances the head cannot lie in the socket. The most that can be said of it is that it lies in the region of the socket. Even if the head has been reduced within the capsule the position of extreme abduction will tend to thin and stretch it, while the thickest and strongest part of the capsule — the ileo-femoral ligament — lies chiefly to the upper and outer side of the head. But there is another possible condition, namely, that the trochanter may be carried into the socket; and in such a case, when the limb is finally brought down in extension, the head will revolve to a position on the inner side of the inferior spine of the ilium, because the trochanter in the socket is the pivotal point of action.

The course that appeals to me and which I have pursued with perfect satisfaction is to fix the hip in plaster for the first few weeks. This I do for convenience and because the hip being immobilized will more rapidly recover from any traumatism that may have been inflicted. Then at the end of a month the child can be put in an apparatus with adjustable wings, to which the abducted thighs can be loosely bound, and gradually the adduction can be increased until the perpendicular is reached. The apparatus I employ permits of free motion save in abduction and adduction, that is, there is no obstruction to flexion and extension. In this way it is possible to anticipate the amount of service the child will have when it begins to walk. As already stated, after ten months the apparatus is removed and the child allowed its freedom, while still in the recumbent posture for two months more.

After Professor Lorenz has ruptured every muscle that resists his preliminary manipulations, he invokes the services of a powerful assistant to make traction upon the limb, while he, by direct pressure, drives the head into the socket. What, I ask, is still resisting him? He has torn all the muscles, the resistance must therefore come from something that he cannot tear, and that something is the ileo-tibial band. It is this that compels him to invoke the services of a powerful assistant. I have attempted to tear the ileo-tibial bands in adult cadavers

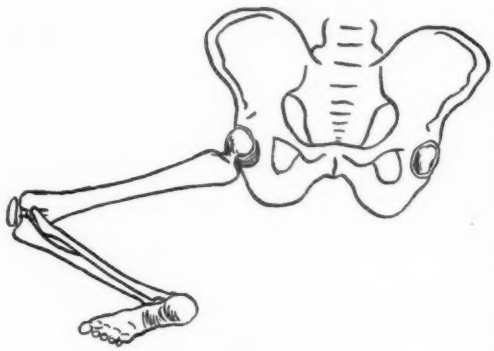


Fig. 16.

and I have never succeeded. After the traction of a thousand pounds, the pelvis has given way with a crash, but the *ileo-tibial* bands are as sound as before the experiment. When Professor Lorenz' assistant makes the traction he also makes abduction, and through abduction and traction, the head of the femur, through powerful pressure is driven beneath the ileo-femoral ligament, suddenly, as with a visible spring, which is apparent to every observer, and apparently, into the socket. The canting of the pelvis, and associated abduction, removed the pressure upon the great trochanter from the ileo-tibial band which the traction created, permitting the head of the femur to descend to a point opposite the socket, when the operator with the aid of his skilled and practical assistant drove the head into the socket. Lorenz acts on the theory that if congenital dislocations are to be reduced at all, they might as well be reduced at a single sitting as during a protracted series of efforts, hence he does all his traumatism at once, forces the head into the socket region and hopes to benefit every case, and perfectly to cure the majority.

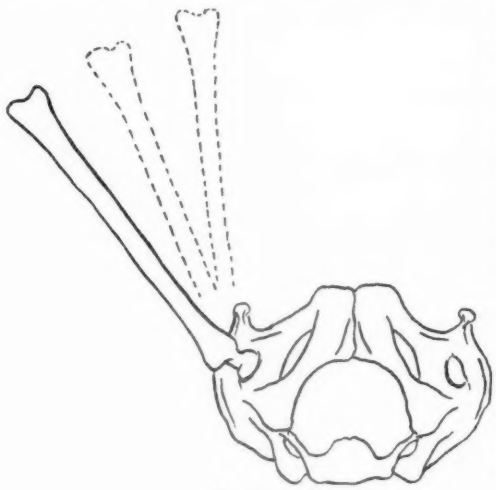


Fig. 17.

In marked contrast with Sir Astley Cooper's method of treating recent clinical dislocations of the hip by the horizontal traction method, is the method of fixation of the pelvis and perpendicular traction. What the London surgeon often required hours to accomplish, with compound pulleys, is now happily accomplished in a few seconds by unaided manual traction, and the same principle holds good in congenital dislocations. Traction directly upward, that is at right angles to the horizontal trunk, is made with flexed femur and flexed knee. When in dorsal dislocations, the thigh is flexed to a right angle, the *head* of the femur lies directly below the socket. In the flexed position the skin, femoral vessels, adductor and flexor muscles, capsule and fascia, are all relaxed. And hence, though the dislocation is of long standing it will offer a minimum of resistance. Thus the surgeon with lever or screw, Figs. 15, 16, guarded with a spring balance, and with a minimum degree of traction, lifts the head to a position if necessary above the level of the socket, and holds it there without effort for a space of fifteen or twenty minutes without fatigue to himself and a minimum of shock to his patient. During all this time his eye rests upon the spring balance which keeps him informed of the exact amount of force employed, and when in his judgment a sufficient amount of stretching has been secured he unhooks the apparatus from the knee, seizes the thigh with one hand, lifts it to a level with the socket, and abducts, while with the thumb of the unoccupied hand pressure is made against the great trochanter. If under these gentle measures the head does not slip over the rim and into the socket, resort to stretching should again be made. The reduction should *be easily accomplished* if the hands of the manipulator are to judge of the replacement.

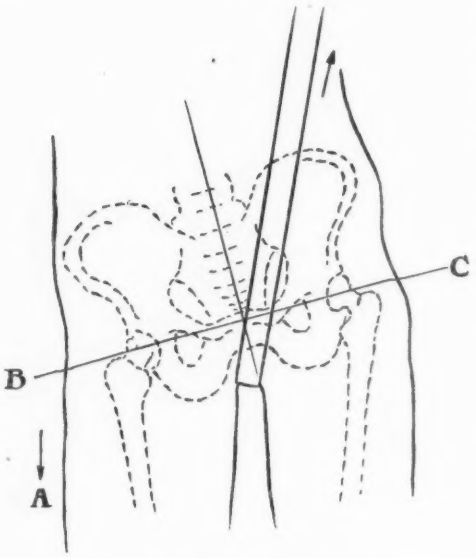


Fig. 18. The traction (*A*) arrow is from the outer angle of the pelvis (*B*), while the counter extension (*C*) arrow is through the perineal band. This necessarily produces canting of the pelvis and abduction of the femur. The more powerful the traction, the greater the degree of canting and abduction.

A final word upon the conditions after reposition of the head. If the head is replaced in the socket, whether it has been replaced within the capsule or has driven a portion of the capsule before it, *two* aids must in all cases be invoked to secure a satisfactory recovery. The head must lie beneath the strong part of the capsule, that is, beneath the ileo-femoral ligament. This part of the capsule is the safeguard against ascent of the head in walking. It is the part of the capsule that in the erect posture holds the head from jutting forward. If, therefore, the head has been carried into the socket it must lie beneath this part of the capsule, and as no one can know positively whether a part of the capsule has been driven before the advancing head, it behooves the surgeon to give the patient ample time to make a new socket. Hence I advocate a full year of dorsal recumbency, the greater part of which with thighs free to move with only restricted adduction.

Another most important aid to complete recovery in the fascia lata. Few are *aware* that the fascia lata preserves a gentle continuous pressure upon the normal hip, and keeps it adjusted to the socket. Few are aware that progression would be impossible without the aid of the fascia lata. Hence when the child has its hip replaced in the socket, with the strong ileo-femoral ligament in front of the femoral head, and the ileo-tibial band making pressure against the great trochanter, the ultimate cure may be most satisfactory and the child have every assurance that normal development with normal activities, will result. As the fascia lata during the years of dislocation did not grow as rapidly as it does in normal conditions, the child's first efforts at locomotion may be hindered, and if only one hip has been treated adduction may be restricted and the formerly dislocated thigh may seem longer than its fellow. *This is a good sign of perfect reposition.* A few months of walking will remedy this and then the cure will be established.

I cannot close without a word of thanks for the encouragement Professor Lorenz has given American surgeons in the treatment of this heretofore greatly neglected deformity. While few resort to his extreme measures, there are hundreds of surgeons to-day who are indebted to him, and who have had successes that a few years ago they would have deemed impossible.

FURTHER CONSIDERATION OF THE SURGICAL TREATMENT OF CANCER OF THE NECK[1]

By GEORGE CRILE, M. D., Cleveland, Ohio

PLAN OF OPERATION. With splendid operative tools in abundance, the inclined head-up posture to lessen the blood-pressure, and the closure of the common carotid artery, hemostasis may now be so perfectly accomplished as to prevent, on the one hand, the contributing factor of the loss of blood to the immediate depression and shock of the operation; and on the other hand, the unfavorable results possible in the final outcome. With tubage of the pharynx all operations within the mouth or oronasal cavity may be done without any inhalation of blood — thereby virtually eliminating the post-operative pneumonia — with the head in any posture most convenient for light and accessibility, and with the anesthetizer entirely away from the field of operation. Likewise the protective zone of granulations, across the deeper planes of the neck, prevents the much dreaded gravity abscess into the mediastinum. Upon these several factors, namely, the control of hemorrhage, the minimizing of shock, the prevention of pneumonia, and of the gravity abscess of the mediastinum, is based the conclusion that surgery has sufficiently advanced to enable us to individualize operations, and disregard the set types of the past.

Hemorrhage. The far-reaching observations of Gaylord and Clews, later confirmed by Beebe and Ewing, Erlich and Bashford, that there may be immunity reaction in carcinoma, and that animals that are bled show less resistance to the growth of carcinoma, has a practical bearing in operations for cancer. According to these observations a patient losing the least blood at the time of operation, other things being equal, would have the best chance for permanent cure. I have gained the impression that this is borne out clinically. To test this point further, I have begun a series of transfusion of blood at the time of or soon after the operation, for the double purpose of making a more certain convalescence, and for the possible advantage of added blood to the patient's resources in his battle against the disease. In addition to the above reasons, a more remote one is worth considering, namely, that certain animals are endowed with a natural immunity to carcinoma, and, though remote there is nevertheless given the opportunity of luckily finding in the donor's blood such immune bodies as might further assist the patient.

The Use of the X-ray. Dr. Hill, of Lakeside Hospital, and others, have treated with the X-ray a considerable number of cancer cases in various regions of the body. I have seen no good results in the use of the X-ray in deep-seated tumors. I have seen superficial growths disappear. Acting upon this, it seemed to me reasonable that, when operating for cases of extensive involvement, if one left the wound wide open the X-ray might then be effective against any remains of cancer tissue. I have, therefore, had a series of cases in the past three years treated in this way. That is to say, the day following the operation, if possible, the dressings are removed and the naked wound is exposed to the X-ray, and this is repeated daily until the local tissues are brought to a reaction, expressed by an erythema. The treatments are continued until the wound is closed, or at least until the time for skin grafting has been reached. Unless some other factor, such as the increased conservatism of blood, or the increased care in the wide dissection, is unexpectedly operative in the group of cases thus treated by the X-ray, I cannot but feel that the X-ray has played a certain, perhaps not unimportant, rôle, in the result.

Relative Value of Tissue Sacrificed. In the cancer period of life the occlusion of the common carotid, and the internal carotid arteries, is often followed by such a high percentage of cerebral softening that I have not in the last 100 or more cases permanently closed either one. Then, too, it is extremely fortunate that a carcinomatous growth almost never involves the sheath of the artery, where I have never seen a recurrence. The ligation of the external

[1] Read before the American Surgical Association, May 7, 1907

carotid artery in itself is a matter of importance, as it carries with it a 2 per cent risk of cerebral embolism by having the thrombus washed away by the blood-stream of the common and internal carotid. The jugular veins, one or both on a single side, or one or both on both sides, may be excised with safety the entire length of the neck. There is such an abundance of veins in all directions in all parts of the neck, that this may not be considered. I have many times removed the sternomastoid, and twice removed the entire sternomastoid from both sides. This inconveniences the patients to a surprisingly small degree. The omohyoids are of minor consequence. This is true of the digastric, the sternothyroid, the sternohyoid and the platysma. The functional importance of one or all of these muscles is so well compensated for by other and deeper muscles, and, at all events, is so trifling as compared with the importance of any advantage their removal might have in the cure of the disease, that they need not be considered.

As to the scar, a patient who is cured of a cancer of the head and neck will have very little concern about any scar that may be left.

Unilateral excision of the vagus is attended by a hoarseness of the voice but very little other consequence. Bilateral excision, of course, is uniformly fatal. Unilateral excision of the phrenic is followed by less than one-half paralysis of the diaphragm, but is very rarely necessary. Likewise the unilateral excision of the hypoglossal is of some importance in the use of the tongue in speech, but a fair degree of compensation may be acquired. Bilateral excision is generally fatal, on account of pneumonia following. Fortunately it very rarely becomes necessary to excise the phrenic, the vagus, or the hypoglossal, even in extreme cases.

TOTAL NUMBER OF OPERATIONS, 150 ON 135 PATIENTS

33 operations on 31 patients between 1900–1904.

30 patients traced.

12 patients no recurrence, 40 per cent.

18 patients dead from carcinoma, or 60 per cent.

1 patient not traced.

55 operations on 48 patients previous to 1900.

35 patients traced.

11 patients no recurrence, or 31 per cent.

23 patients dead from carcinoma, or 65 per cent.

13 patients not traced.

LOCATION OF THE GROWTH

Location	Operations
Epithelioma of lateral margin of eye	6
Carcinoma of face (including maxillæ)	18
Carcinoma of lips	37
Carcinoma of floor of mouth	4
Carcinoma of soft palate	2
Carcinoma of alveolar process	2
Carcinoma of pharynx	1
Carcinoma of tongue	14
Carcinoma of tonsil	2
Carcinoma of nose	5
Carcinoma of scalp	2
Carcinoma of lymphatic glands	28
Carcinoma of parotid	5
Carcinoma-branchiogenic	4
Carcinoma of larynx	15
Carcinoma of thyroid	5
Total	150

Males, 112.

Females, 16.

No fatality in last 40 operations.

I would, therefore, advance the following propositions:

1. That the operative technique of this field has reached the point of development which enables the surgeon to operate each case individually, with sole reference to excising every particle of the malignant growth, and in no way recognizing the so-called types of operation, such as Whitehead's, Kocher's, etc.

2. That the loss of blood plays an important rôle in the remote, as well as in the immediate, results.

3. That the immediate use of the X-ray applied upon the naked wound is useful.

4. That the only tissue that must be respected, to the extent of determining the breadth of the excision of the growth, is the common or internal artery; that the sternomastoids — one or both — the omohoids, the digastric, the the sternothyroid, sternohyoid, and platysma, muscles, either on one or on both sides, need not be considered as of functional importance

in weighing the chances for a successful eradication of a malignant growth. On the same ground, neither the internal, nor the external jugular, on one or on both sides, need be considered, nor a unilateral excision of the vagus, of the phrenic, or of the hypoglossal.

5. That the creation of a granulation barrier across the base of the neck under cocaine-oxide anesthesia, by the packing of iodoform-gauze in the deep planes of the neck, prior to operation, protects with almost a certainty the mediastinum.

6. That the immediate operative risk has fallen to a minimum.

7. That the chances for final cures compare favorably with that of cancer of the breast.

THE DESIRABILITY OF EARLY OPERATIONS UPON THE NERVES IN ISCHEMIC PARALYSIS[1]

By LEONARD FREEMAN, M. D., Denver, Colorado

VOLKMANN'S ischemic paralysis, as is well-known, occurs with few exceptions in children, following fractures of the forearm, and is nearly always due to tight bandages or splints. The muscles being deprived of blood by pressure, their cells undergo disintegration and absorption and are replaced by connective-tissue. When the circulation is rapidly cut off it has been estimated that the muscles die in about seven hours; but when the process is slower, death may not result for days or weeks, and may then be only partial, permitting of more or less complete regeneration. The immediate result of this local muscular death is a form of *rigor mortis*, causing contractures similar to those seen in the cadaver, thus explaining why the fingers are occasionally found strongly flexed upon removing the splints but a few hours after their application. Such postmortem rigidity, however, is only the first step in ischemic paralysis. The real process develops later, resulting from the slow solidification and contraction of connective-tissue. The affected muscles become hard and shrunken, resembling, in extreme cases, mere bands of tough, fibrous material. The fingers grow permanently flexed, occasionally to such a degree that the nails dig into the palm. Rarely the dorsal muscles are more strongly contracted than the palmar, resulting in extension of the wrist and proximal phalanges, with flexion of the terminal phalanges, leading to a peculiar claw-like deformity.

Just how much the nerves are concerned in the phenomena of ischemic paralysis seems to be uncertain. In some instances they do not appear to be involved at all; while in others, sensory and trophic disturbances are the causes of very distressing symptoms. A primary neuritis is not uncommon, due directly to splint pressure aided by an insufficient supply of blood, and manifesting itself by the usual disturbances in sensation. This may disappear, especially if the splints are promptly loosened, or it may pass directly into the later and more serious form of pressure-neuritis, due to cicatricial contractures of the muscles, to which I especially desire to call attention. The damage from this latter form may be slight, or it may be so great that the nerves are changed into fibrous bands and almost pinched out of existence, their functions being correspondingly destroyed. They are often irregular and nodular where pressed upon, while above this point they are thick, soft, and congested. Nothing could be more evident than these nerve-lesions — they are often so marked as to force themselves instantly upon the attention of the operator. They result in sensory and trophic disturbances of the hand, varying all the way from slight anomalies in sensation to that deplorable condition in which the skin is glazed, bluish, and perhaps blistered, and the sense of touch destroyed. The hand may become so sensitive and painful as not only to inhibit its usefulness, but to render it an intolerable nuisance to its possessor. One of my

[1] Read before the American Surgical Association, May 7, 1907.

patients, an extreme case, even went so far as to beg me to amputate his arm if there was no other way to relieve his distress.

It is justifiable to assume that Volkmann's paralysis originates in the muscles, hence treatment should first be directed towards their recovery — by removal of constricting bandages and splints, persistent massage, electricity, passive and active motion, etc., and in many instances success will be achieved. It must not be lost sight of, however, that *the condition of a muscle depends largely upon the condition of its nerve.* If the nerve is badly injured the muscle suffers until the nerve is repaired. In other words, a species of "vicious circle" exists; cicatricial changes in the muscles injure the nerves by compression, and the injured nerves in turn prevent the regeneration of the muscles. Hence we are forced to give attention to the nerves, when involved, as well as to the muscles.

The above considerations naturally lead to the following conclusions:

1. Every case of ischemic paralysis — whether slight or marked, whether nerves are involved or muscles alone — should first be treated by massage and electricity, combined with such active and passive motions as are best adapted to lengthen the contracted muscles or prevent their further shortening. The massage should be vigorous and persistent, and the stretching of the muscles — by simultaneous extension of wrist and fingers — as decided as the patient can bear. As mentioned by Furgusson, however, too violent extension, especially under anesthesia, might be disastrous by causing rupture of the nerves imbedded in the cicatricial muscles.

2. In many cases, under this treatment, when the lesions are purely muscular, or when the nerves are but slightly implicated, improvement will occur in time, followed often by more or less complete recovery, although the tendons may require lengthening by some plastic operation. And even when the nerves are badly pinched, as evidenced by changes in sensation and nutrition, the results may still occasionally be good.

3. *If, however, in these bad cases, improvement in nerve-function does not begin promptly and progress satisfactorily, an early operation should be done to relieve the nerve-trunks from pressure before they become hopelessly injured, and also for the purpose of aiding the recovery of the muscles by improving their innervation.* Nevertheless, following an operation, other methods of treatment should never be neglected.

When we consider the prolonged, and perhaps permanent, disability and suffering produced by pinching of the nerves, the atrophy which they plainly show, and the rapid degeneration which they undergo; it seems remarkable that early operations have not been urged in the past, or even alluded to — as far as I have observed — particularly as such operations are neither very difficult nor very dangerous. Even in cases where recovery ultimately takes place, early liberation of the nerves would often prevent many months of useless pain and incapacity. When, under other circumstances, a nerve is caught in a cicatrix, or pressed upon by callus or a spicula of bone, the indications are always plain — the difficulty must be removed as soon as possible. A similar plan is invariably followed in dealing with the brain and spinal cord. Why then should the surgeon hesitate to act just as promptly when the injurious pressure arises from a cicatricial muscle? The only reason seems to be that attention has not been directed to the subject.

Theoretical considerations, corroborated by my experience, indicate that the nerves are apt to be pinched at certain points — the *median*, in passing through the pronator radii teres;[2] the *ulnar*, in its course between the two portions of the flexor carpi ulnaris, just below the internal condyle; and the *posterior interosseous*, in traversing the fibers of the supinator brevis below the elbow. These points are easily reached by longitudinal incisions, which may be extended upward or downward to suit the requirements of the case. A good plan is to expose the nerves above the places of compression, which is readily done by reason of their large size, and then follow them down as far as may be necessary. They may be so intimately incorporated with the cicatricial muscles in bad cases that they can only be liberated by the most painstaking dissection, thus

[2] As a matter of interest in this connection, it may be mentioned that strong voluntary contraction of the pronator radii teres, if continued for a time in the normal arm, may produce a tingling sensation in the portion of the hand supplied by the median nerve.

emphasizing the marked effects of pressure. In order to prevent a recurrence of trouble it is often desirable to lift a nerve out of its cicatricial bed to a more superficial position beneath the subcutaneous fascia, or possibly to excise a portion of a hopelessly damaged muscle.

The cases on which I have operated have made a deep impression upon me.[3] They are as follows:

CASE 1. A girl of about 10 years of age who had broken both bones of the forearm some 3 months before I saw her. Splints were used for 4 weeks, followed by a plaster-of-Paris cast for several weeks longer. There was satisfactory union. Upon the palmar surface of the forearm and hand, and upon the back of the hand, were several recent scars, the results of pressure-necrosis. Cyanosis was present from defective capillary circulation, although the pulse was good. The skin had a drawn and glazed appearance, with a tendency to trophic disturbances, and was almost completely anesthetic. The fingers were strongly contracted, the muscles of the forearm indurated and paralyzed, and the hand useless. Owing to the great disability from involvement of the nerves, I decided to operate at once.

Operation. Through appropriate longitudinal incisions, the median nerve was found to be decidedly pinched by the cicatricial pronator radii teres, the ulnar to a less extent by the flexor carpi ulnaris, and the radial but slightly if at all involved. Above the points of compression the nerves were large and soft. After freeing the nerves they were brought up beneath the subcutaneous fascia, and the muscles reunited beneath with catgut. Primary healing. In a few days tingling sensations were felt in the fingers. Steady improvement followed until at the end of 3 months — during which time massage was employed — sensation and motion in the hand were almost complete and the circulatory and trophic disturbances had disappeared. On February 17, 1907 — over 3 years after the operation — the hand and arm were in nearly perfect condition, with no atrophy or induration of the muscles, with full motion of wrist and fingers, and normal nerve-function. No inconvenience was experienced from the superficial position of the nerves beneath the skin.

CASE 2. A young man, 19 years of age, who had received an injury of the fleshy portion of the right forearm about a year before he came under my care. No splints had been used, bandages alone having been applied, but nevertheless pronounced ischemic paralysis had developed, the fingers beginning to flex in a few weeks. The forearm was pronated when I saw him; the muscles hard and shrunken, especially near the elbow; and the fingers strongly flexed. The capillary circulation was poor and the sense of touch absent, rendering the hand useless. The pulse was good. The patient complained bitterly of pain and burning sensations, and there was a tendency to blistering and ulceration of the skin.

[3] I desire to acknowledge indebtedness to Dr. S. D. Hopkins for valuable advice and assistance in the treatment of these cases.

Operation, on December 12, 1906. The median and ulnar nerves were found badly atrophied, and pinched; the former by the pronator radii teres, and the latter by the flexor carpi ulnaris. They were irregular in size and nodular. In order to insure permanent freedom of the median nerve, a portion of the useless pronator was removed, and, with the same purpose in view, the ulnar was transplanted to a position beneath the skin.

The pain, burning, and other disagreeable sensations soon disappeared following the operation, and the sense of touch returned to a considerable degree. The trophic disturbances also underwent marked improvement. Up to the present time, however — about 5 months — there has been but slight gain in motion, but it can be said that the hand is no longer a source of annoyance and suffering.

CASE 3. A boy of 16 who had broken the left olecranon process 2½ years before he came under my observation. A plaster cast had been employed in treatment. About 2 weeks after the removal of the cast, contracture of the fingers began and became quite marked at the end of 3 months. When I saw him, digital flexion was almost complete, the skin somewhat livid from poor capillary circulation, and sensation very imperfect. There was a good pulse. The muscles of the pronated forearm were atrophied, and the hand practically useless, in spite of the fact that the fingers could be moved slightly. There was but little pain, and no trophic disturbances existed. As in the previous case, an operation was done upon the nerves solely in the hope of restoring sensation to the fingers, the condition of the muscles being considered beyond relief.

Operation, February 8, 1907. Through longitudinal incisions, the median and ulnar nerves were dissected with some difficulty form the cicatricial pronator radii teres and flexor carpi ulnaris and placed subcutaneously. They were firmly pinched and adherent, especially the ulnar, and resembled mere fibrous bands rather than nerves. Above the points of compression they were abnormally large, soft, and congested. When the case was last seen, perhaps a month after the operation, there was already an improvement in sensation, which, it is hoped, will continue.

These three cases serve to illustrate the point which I have already emphasized, that when the nerves are badly involved in ischemic paralysis, and show no signs of prompt recovery, they should be liberated from compression early, before hopeless degenerative changes set in. This was done, in Case 1, with an eminently satisfactory result. In Cases 2 and 3, operation was delayed until the end of 1 year and 2½ years respectively, when, although improvement in nerve-function was obtianed, the results were nevertheless incomplete. I believe they would have been much better if the nerves had been liberated sooner.

PROLAPSUS FUNIS

Its Etiology and a New Method of Treatment in Cephalic Presentations. A Review of Fifty-one Cases

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NAEGALE (1) defines a cord as fore-lying or presenting when it can be palpated within the intact membranes, and as prolapsed when it has passed outside of the bag of waters after the liquor amnii has wholly or partially escaped. Inasmuch as the cord may be subjected to pressure while still within the uterine cavity, and complicate the labor to the same extent as if it appeared externally, we may say that the cord has prolapsed when it has passed to or below the level of the greatest diameter of the presenting pole of the fetus, so that it may become subject to harmful pressure between the fetus and the uterine wall or the pelvic canal. Jacquemier (2) distinguished three varieties of this complication: the fore-lying cord, prolapse into the vagina, and prolapse externally, and claimed that the fetal mortality was increased the further the loop of the cord protruded from the cervix, a claim that is still true in many cases. This division is, however, dependant upon the duration of the prolapse and the length of the cord, for, if it be long enough, nearly every cord will finally appear externally.

From the earliest times recorded, the fetal mortality from prolapse of the cord has been very heavy, notwithstanding all the various methods of treatment that have been tried with varying success. Hecker (3) places the mortality at 37.6 per cent, Scanzoni and Churchill at 53 per cent, Charpentier at 79 per cent. Englemann claims that in head labors 64 per cent are lost, while in breech and transverse presentations only 50 per cent survive. Condie (4) found that in 722 cases of prolapse in over 150,000 labors, 375 children died, over 50 per cent. Churchill (5) in another series of 355 cases found that 220 children perished, over 60 per cent. Schaad (6) reported 34 per cent mortality from the clinic in Berne. In the Berlin Lying-in Hospital from 1858 to 1871, Englemann (7) reports 365 cases of which 194 children died, 52.5 per cent. N. M. Porschnjakow (8) found a mortality of 53.5 per cent in his series of about 225 cases. In the fifty-one cases reported by the author, twenty-six children were lost, giving a gross mortality of 50.9 per cent. We may safely say, therefore, that prolapse of the umbilical cord kills about one half of the children at birth, but that, in selected cases, where the patient is under competent care early in the labor, this fetal mortality can be some what reduced.

In over 7900 labors under the care of the Chicago Lying-in Hospital and Dispensary, prolapse of the cord occurred 48 times, or once in 164 cases. The frequency of prolapse varies with different authors. Michaelis gives the highest ratio in Kiel, finding 27 cases in 2400 labors or 1 to 89. The ratio is explained by the great prevalence of rachitis in this district. Scanzoni, in 178,043 women, found 699 prolapses or 1 to 254 cases. Condie (4) found among 84,991 British women, 404 cases or 1 to 210; among 36,546 French women, 98 cases or 1 to 373; and among 31,037 German women, 197 cases or 1 to 163. This gives a gross ratio of 1 to 218. Simpson believes the difference of frequency in the women of these countries is due to the posture assumed during labor. The French women, he claims, lie with the shoulders low and the pelvis raised; the English women are delivered on the side; while the German women lie on the back, with the shoulders raised and the pelvis low. Hecker and Hildebrandt found the ratio to be 1 to 148 in head labors. Churchill found one prolapse to 240 cases in a series of 105,000 labors. Lachappelle reported 1 to 380; Jacquemier 1 to 170. Prolapse of the cord, while not a frequent complication, occurs sufficiently often to put the medical attendant on his guard, and is sufficiently dangerous to demand an early diagnosis and proper treatment.

The etiology of prolapsus is not complex. Too much weight in determining the etiological factors has been given to various conditions found at the time of labor that really play only a secondary part. The frequency with which these secondary factors occur in labors, not complicated by prolapse, should deter us from deciding offhand just what action they have been enabled to exert. Certain cases are seen in which it is impossible or impracticable to ascertain definitely the presence or absence of primary causes and, as a result, too much importance is ascribed to minor conditions which may be found and yet only predispose to this complication. In this series of 51 cases, a definite primary cause was found in 38 (75 per cent), and no record was made in 13. In several of these 13 cases, the internes were called late in the labor, and doubtless the primary cause was not discovered, as internal examinations are not made late in the second stage, except for special indications. The primary cause does not always act throughout the entire period of labor, though it may do so in many cases. Certain cases of hydramnion, sudden escape of the liquor amnii when the patient is erect, or when there is a malpresentation that becomes rectified spontaneously, are all examples of causes that are effective for a time only, and it might be difficult or impossible to discover their presence late in the labor. Hence it is reasonable to assume that in the majority of these 13 cases, the primary cause was present but was not discovered by the internes, because of a late arrival or through lack of a careful examination.

PRIMARY CAUSES

The chief cause of prolapse is a *lack of continuous and complete adaptation of the lower uterine segment to the presenting part of the fetus*. Normally, the lower pole of the fetus is kept applied to the lower uterine segment by gravity, the intra-uterine tension, and the intra-abdominal pressure. After the rupture of the membranes, the intra-uterine tension becomes the fetal-axis pressure. This contact becomes still closer during a uterine contraction. If the lower uterine segment is not closely applied to the presenting part of the fetus, and the liquor amnii is thereby enabled to flow from the general cavity of the uterus toward the cervix, the cord, which has a specific gravity of about 1.018, usually lighter than the amniotic fluid, is apt to slip down into the so-called fore-waters and a fore-lying cord is the result. If the membranes rupture when there is a direct connection between the fore-waters and the remainder of the liquor amnii in the uterus, or if the vis a tergo is sufficiently powerful to force the fluid past the presenting part, not only is the cord liable to become prolapsed but the liquor amnii may become wholly lost. If it is not lost immediately, the fluid is liable to leak away gradually, and to allow the uterine walls to come in direct contact with the fetal body at all points. Any condition, therefore, that interferes with the close adaptation of the lower uterine segment to the presenting part, or that allows a connection between the two portions of the liquor amnii, will directly cause a prolapse of the cord.

Concerning *parity*, we find that in 51 cases of prolapse there were but 4 primiparæ (8 per cent) and 47 multiparæ (92 per cent). This percentage is small as compared with that of other reports. Of these four women, two had contracted pelves, one having a transverse presentation. Twenty-seven women (53 per cent) had had four or more pregnancies. The condition of many ill-nourished and overworked multiparæ, who are compelled to labor for years, would predispose to a weakened and relaxed condition of the uterine walls. The resistance or tonus of the uterus plays an important rôle in the etiology of prolapse. In the primiparous woman, the uterus is strong, active, and vigorous. The fetal head has been pushed down firmly into the pelvis, and against the internal os uteri. Frequently the head becomes engaged long before labor sets in, and the cervix and lower uterine segment can be felt stretched tightly over it. The abdominal muscles increase the intra-abdominal tension, and aid in keeping the head in its proper position. These are the cases in which prolapse is rarely seen. In the multipara, on the other hand, the uterus has lost its tonus. Infections from old lacerations of the cervix, from old abortions, or subinvolution, tend to reduce the elasticity of its walls. The organ may be displaced laterally by exu-

dates in the broad ligaments, or tumors in the pelvis, or by adhesions to the various viscera, and be unable to adapt itself to the fetal body. Its walls may be so relaxed from repeated pregnancies, that the fetus may assume almost any posture in its cavity. The fetal head may remain in or above the pelvic inlet until the pains of labor force it down, and as a result the cord may become fore-lying before the pregnancy terminates. The lack of support from the abdominal muscles, due to a wide diastasis, predisposes to a pendulous abdomen and uterus, and in this condition the lower fetal pole may be still further lifted out of the inlet.

A clear clinical history of previous labors may throw considerable light upon the case in hand. Twelve cases (26 per cent) gave a definite history of trouble, two of whom had had a previous prolapse. Case 3 is remarkable for having three labors, complicated by prolapse because of a flat pelvis, though in her last labor, hydramnion was the main cause. There was a history of two former transverse presentations, one in a flat pelvis. Five children were born dead, whether from compression of the cord we do not know. Six former labors were terminated by the forceps. In only 22 cases (43 per cent) was there a clear history of easy and normal labors.

Overdistention of the uterine walls is another primary cause of prolapse. Whether due to multiple pregnancy or hydramnion, the lower uterine segment is unable to adjust itself properly to the fetus. In the present series, there were no cases of multiple pregnancy, though probably fifty sets of twins and three sets of triplets have been cared for by the Dispensary. If both twins present longitudinally, it is easy to see how prolapse may occur in the case of that fetus that did the more effective work in dilating the cervix.

Hydramnion acts not only by allowing malpresentation, and a too great motility of the fetus, but the uterine muscle itself is so thinned out that its contractile and retractile power is markedly diminished. As the fore-waters and the main portion of liquor amnii are continuous, if the membranes rupture early, as they are apt to do, the gush of amniotic fluid carries the cord past the head out of the uterine cavity. Hydramnion occurred five times (9.8 per cent), in one case complicating a prolapse of the arm, in another, a transverse presentation. Premature rupture of the membranes, though common in this condition, occurred only once.

Premature labor has much the same effect as hydramnion, though in a reversed way. The small size of the fetus, its greater motility, its softer and more pliable consistency, coupled with the unpreparedness of the cervix and lower uterine segment for labor, are potent factors in the production of prolapse. Estimating a fetus as mature if it measures 50 cm. or over (Shauta), we find that there were 16 children who were short, 8 of whom were 47 cm. or less. The smallest fetus measured 42 cm. The occurrence of hydramnion, multiple pregnancy, and premature labor, in the same labor, which not infrequently happens, would strongly predispose to prolapse of the cord.

The more completely the lower uterine segment closes down on the presenting part of the fetus, the rarer is the occurrence of prolapse, and the more dangerous the cases where it does occur. This close application of the cervix depends to a great extent upon the form and consistency of the presenting part. In vertex labors, and especially in Rœderer's obliquity of the head, this relation is very intimate, and prolapse seldom occurs. In the deflexion attitudes, as brow and face presentations, and in breech and transverse presentations, this relation is so disturbed that prolapse is more common. *Malpresentation of the fetus* is largely dependent upon the size and form of the pelvic inlet, so that it can hardly be classed as a primary cause, and yet the presenting part forms the chief resistance to the dilating cervix, and plays a direct part in the production of prolapse. Of the 51 cases, 38 (75 per cent) were vertex, 2 (4 per cent) were face, 3 (6 per cent) were breech, and 7 (14 per cent) were transverse presentations. Of the 38 vertex labors, 17 children were lost (45 per cent). One face case was saved, the other was lost. The three children presenting by the breech were lost, while only three of the seven cross-births were saved. Other factors, however, had a part in raising the mortality outside of

the prolapse itself. Of the 38 cases, 16 are recorded as occipito-læva-anterior, 13 as occipito-dextra-anterior, 5 as occipito-dextra-posterior, and 2 as occipito-læva-posterior, 1 as a posterior-parietal-bone presentation and 1 not recorded. Probably many of the heads found in the second position were originally in the third, and the examination was made when anterior rotation was in progress.

None of the cases was complicated by *tumors* of the uterine wall or adjacent organs or tissues, unless we call the cases of placenta prævia an exception. The placenta, when situated low in the uterus, undoubtedly interferes with the mechanism of labor. The Dispensary women were found singularly free from fibroids and other tumors. Tumors, in order to cause prolapse of the cord directly, should lie in the lower uterine segment and interfere with the normal mechanism of labor. If the tumor is found in the uterine wall near or in the cervix, there will result during labor an unequal contraction and dilatation, as pointed out by Wiegand and Michaelis, and this fact constitutes an important cause in itself.

No *monsters* were found in the series, though quite a number have been cared for in the service. Other authors have reported cases where various fetal deformities were complicated by prolapse in labor. Chief among these are spina bifida, distended bladder, and cystic kidney, in breech presentations; and hydrocephalus, meningocele, hydrencephalocele, and the various forms classed under the general head of teratocephalus, in cephalic labors. The different forms of united twins, classed under the head of epischistoi, hyposchistoi, and amphischistoi, while rare, would certainly have a great influence in causing prolapse of the cord in the labors which they complicate.

Deformities of the pelvis constitute one of the principal primary causes of prolapse of the cord. Upon the shape and size of the bony canal depends to a great degree not only the frequency but also the ultimate result of our treatment of these cases. Litzmann and Michaelis claim that prolapse occurs from four to six times as often in the flat as in the normal pelvis. Englemann estimates it to be sixteen times as frequent. Kaltenbach (10) says that prolapse in a primipara should always excite suspicion of a flat pelvis. Roper (11) reports a case in which prolapse occurred in three successive labors because of a flat pelvis. Hirschfeld reported 25 per cent of labors complicated by prolapse as occurring in flat pelves. Hildebrandt raises the percentage to thirty-three. It is estimated that 10 per cent of deformed pelves are complicated by prolapse of the cord.

In the present series, no record was made in 12 cases. Deformity was present in 22 pelves. This leaves only 17 in which the pelvis was probably normal. Excluding the 12 cases, in which the pelvis may or may not have been deformed, we have a percentage of nearly 57. This rate is merely an estimate, for the reason that it is impossible to deduct accurately the true conjugate from the Baudelocque diameter, and further because these measurements were taken by a large number of internes, of more or less experience in taking pelvic measurements; still it goes to prove the great frequency of deformed pelves in this complication, and helps to explain the high mortality in which at least some of the children are lost, not as a result of the prolapse, but from the mechanical difficulties in the extraction. Of the 12 flat pelves, composed of the simple and rachitic variety, 4 children were lost. Two of these children were delivered by embryotomy because of the deformity. These deformities were not marked in two of the cases. Six pelves are listed as generally contracted (18 per cent). The justo-minor, or round pelvis, is the most favorable variety in the treatment, provided a successful reposition can be carried out early in labor. The close application of the lower uterine segment to the well-flexed head, will leave no intervening space where a prolapse can take place. If reposition cannot be carried out, the fetus will die in nearly every case if the labor be at term. Of these six cases, two children died. The first woman was a para-ten, the second was a para-eight, the third had a placenta prævia, and the labor of the fourth was complicated by hydramnion. The sixth woman had the cord replaced and, as the head came down into the pelvis, a recurrence of the prolapse was prevented and a living child was born spontaneously. The prolapse was found to depend, therefore, upon

other conditions than the pelvis in four of the cases, while in two, no other reason was given in the records. One pelvis was found to be of the flat, generally contracted type, and the fetus had been dead for hours. No other cause assigned. There were three enlarged pelves. Two children died but both could probably have been saved by earlier operative treatment. In the determination of deformity, a flat pelvis was said to exist if the external conjugate was under 19 cm.; a justo-major pelvis, if the Baudelocque was over 21 cm. The generally contracted pelvis was recognized by the decrease in the interspinous, inter-cristous, and external conjugate diameters, and by a circumference of under 90 cm. The mechanism of labor was also of material assistance in making the diagnosis.

Finally, under the primary causes, are those cases where prolapse occurred during the performance of a forcep-operation, a version, or an attempted reposition of a prolapsed arm. The relations of the lower uterine segment to the fetal head are mechanically disturbed by the hand of the operator, or by the presence of the instrument. No case of this character occurred in the series, but the author was privileged to see a case where the double manual of Siegemund was being tried, for a difficult and late version, and the cord not only prolapsed but persisted in getting tangled up with the version sling, until all pulsation had ceased and delivery was effected by craniotomy. Theoretically, prolapse would be more common in those cases where the hand was passed into the uterine cavity to grasp a foot in version, or in bringing down a foot in double breech cases.

SECONDARY CAUSES

There are several factors that lead a secondary rôle in the etiology of prolapse, although many authors have formerly laid much stress upon their importance. While they are frequently associated with prolapse, still, in the great majority of cases, other more potent factors were also present. No matter how frequently or persistently these secondary factors may be active, prolapse will not occur unless the relation of the cervix to the presenting part is disturbed.

Length of the cord. The cord varied in length from 42 to 140 cm. If, according to Shauta (12), the length of a normal cord is from 50 to 60 centimeters, we find that prolapse occurred in 19 cases where the cord was normal or less than normal. Five cords were between 40 and 50 cm., 8 were between 60 and 70, 8 between 70 and 80, 4 between 80 and 90, and 3 were over 110 cm. in length. Cases are frequently seen in which cords of great length are found in labor, and yet no prolapse has occurred. The fact that forty-three per cent of the cords were not of abnormal length, argues that length alone has little to do with the accident in the absence of stronger factors. The coiling of the cord around the head and neck is probably one of Nature's methods of treating a long cord in utero. Englemann asserts that if the fetal end of the cord is coiled around the neck, prolapse is prevented if the head presents; whereas, if the placental end is coiled, prolapse may occur as the loop of cord is placed permanently in the lower uterine segment and in close proximity to the cervix.

Low Insertion of the Placenta. The records are incomplete in showing the cases in which a low insertion of the placenta existed. The opening in the membranes indicates a low insertion if four inches or less of membrane lies between the rent and the placental margin. Without knowing the distance from the rent to the after-birth, little can be said. The openings are described as marginal, including two cases of placenta prævia, 27 are given as lateral, and 8 as central. While the presence of the placenta in the lower uterine segment and near the cervix predisposes to prolapse, I agree with Englemann that the main cause is not the proximity of the cord to the cervix, but the presence of a soft and yielding body in the pelvic canal that interferes with the normal mechanism of labor, in the same manner as a full bladder or rectum, and to a less degree as a tumor. In placenta prævia the danger to the mother from hemorrhage rightly overshadows the care given to the child, and some children are lost in the zeal displayed in following the injunction that he will save the greatest number of mothers who disregards the life of the child.

Insertion of the Cord. The insertion of the cord in the placenta is another minor point. A marginal insertion into the placenta lying in the lower uterine segment would predispose to prolapse but, unless other factors were also present, it would not occur. Four cords are recorded as being inserted into the placental margin, 18 are described as central, and 22 as eccentric and lateral.

Artificial rupture of the membranes was resorted to in 9 cases, 3 complicated by hydramnion. The cervix was dilated at the time of rupture in all save 2 cases, and these were accidental. The escape of a profuse quantity of liquor amnii, during an artificial or spontaneous rupture of the membranes, is liable to carry down a loop of the cord, and this danger should always be kept in mind in performing this little operation. The upright or squatting posture, or a position where the pelvis is lower than the shoulders, is apt to favor a prolapse, especially if the membranes rupture during a uterine contraction.

Premature Rupture of the Membranes. Rupture of the membranes in the first stage of labor is a lamentable accident, and one that should be avoided under all circumstances, except where compression of the cord occurs in the intact membranes. The amnion is the stronger membrane, while the chorion is usually weak and friable. The membranes are liable to rupture when the cervix admits one finger. The early rupture is oftentimes due to the same cause as the prolapse itself, usually a deformed pelvis and the disturbed mechanism of labor. The weakness of the membranes has been ascribed to a generally weakened and exhausted condition of the patient, either one suffering from constitutional disease, or one who manages to put forth a baby every year. Severe mechanical strain at the time of labor may overcome its integrity. Chronic disease of the cervix, with an irritating discharge, is said to corrode the membranes and lessen their resistance to the intra-uterine tension.

The Last Secondary Cause is the presence of prolapse of other portions of the fetal body. Prolapse of the arms and legs is simply another evidence of the lack of proper relation between the lower uterine segment and the presenting part. Generally the head is not engaged in the pelvis unless it is premature or the pelvis is large. As the limb relieves the cord from pressure, if both lie together, the prognosis is better because of the added presence of the limb. Eight cases were complicated by prolapse of other members; two of the foot, six of the arm, and one of the hand and foot. Four children were lost; one because of the late arrival of the intern, one because of a difficult extraction, and one where the operation was delayed too long. This gives a real mortality of only twelve and a half per cent. Prolapse of the arm in cephalic presentations is rather a favorable accident, because it delays engagement of the head, and tends to prevent pressure on the cord.

The Final Treatment of the Cases includes one Braxton-Hick's version and subsequent extraction. This baby died. There were also 6 embryotomies, 26 versions, 5 forceps, 2 extractions by the breech, and 11 spontaneous deliveries. Of the 26 versions, 10 children were lost (38 per cent). Of the 5 forcep cases, 4 children lived, and in the high operation the child died. Both children extracted by the breech died, but they were in poor condition from the start. Of the 11 spontaneous deliveries, 7 children were born dead (63 per cent). Reposition of the cord was tried in 5 cases, with 3 living children. The Trendelenburg position was used in 9 cases and the knee-chest posture in 4.

The Death of the Fetus is undoubtedly caused by asphyxia, following compression of the cord. Various theories have been given by the earlier authors to account for the child's death. Smellie and Osiander claimed that the cooling of the cord, when it lay outside of the vulva, produced a coagulation of the blood and interfered with the funic circulation. Wiegand and Baudelocque found that the umbilical vein was compressed, while the arteries because of their more elastic walls escaped, and consequently the fetus died from syncope and acute anemia. Adolph and Gehrter, on the other hand, found compression of the arteries only, and said that the child died from apoplexy. Hebenstreit found that death resulted from the accumulation of blood in the heart, Adolph found hemorrhage in the lungs, and Waldkirsch in the brain. As it is the plan of Nature that the

fetus shall receive its sole supply of oxygen through the cord and placenta, until it is delivered at birth, so any interference in this mechanism will result, according to the degree of compression, in threatened or actual asphyxia. The fetus is enabled to withstand a moderate compression of the cord for a certain period of time. While we cannot accept the report of Arneth (Bedford's *Obstetrics*, 1861, p. 462), who mentioned four cases in which no pulsation of the cord had been found for half an hour before delivery, and yet in each instance the child was born alive, still we know that a child can withstand a complete interruption of the funic circulation for at least eight minutes, and be revived after birth. Premature children withstand this compression much better than children at full term.

According to Bumm (13), the final result of disturbance of the funic circulation is the increasing venosity of the blood, a decrease of oxygen, and an excess of carbon dioxide. This leads to a stimulation of the respiratory center of the medulla oblongata, and the fetus reacts with attempts at respirations in the same manner as the new-born child. Whereas the newly born child fills its lungs with air, the other fills his lungs with liquor amnii, mucus, or blood. Because of the partial expansion of the chest, the blood-vessels in the lungs become opened, and receive a portion of blood from the right ventricle of the heart. The descending aorta receives little blood; as a consequence, through the ductus Botalli, the pressure in the arterial system and in the funic arteries falls, the placental circulation becomes weaker, and the interchange of gases decreases. With each effort at respiration, this vicious circle increases. Finally, the center of respiration becomes dulled by the increasing venosity of the blood, and the efforts to breathe cease. After a short interval the pulsation of the heart ceases, and the child is dead from asphyxia. It is not uncommon to find evidence of a former partial asphyxia in a normal labor, by the presence of old meconium in the amniotic fluid, and many of these children are born in a healthy and vigorous condition when the liquor amnii is even fetid. The presence of fresh meconium was noticed in 17 cases in my series, and in 4 of these the fetus was already dead. In only 32 cases was there any record of the condition of the liquor amnii, showing that in 53 per cent of the cases a partial or complete asphyxia was present. Of these 17 cases where meconium was present, 4 suffered from asphyxia livida, 2 from asphyxia pallida, and 11 babies died.

Many autopsies have been made upon the bodies of children dead from compression of the cord. The only findings are changes due to the disturbances of the circulation. Congestions, edemas, and hemorrhages of the spleen, kidneys, liver, lungs, brain, and meninges, constitute the main pathologic picture of the disease. In cases where the compression has been of moderate degree and of long duration, congestion and edema predominate; while in those cases where the compression has been complete and sudden, the hemorrhagesa bound. The colon is usually emptied of a portion of meconium, and the stomach contains meconium, lanugo hairs, and vernix caseosa, showing that the child had swallowed the fluid during its convulsive seizures.

The prognosis as to the child's life depends to a great extent upon the time when the prolapse occurs, and upon the interference with the funic circulation. If the conditions are present for an immediate extraction, the outlook is decidedly better than when the accident occurred in the first stage of labor. The earlier the prolapse occurs before the os is fully dilated, the more serious is the outlook. The second important fact to determine is as to the extent and degree of compression, and its effect upon the fetus. The three signs of threatened intrauterine asphyxia usually given are: the presence of fresh meconium in the liquor amnii in all save breech presentations; the convulsive motions of the fetus; and the difference in the strength and rapidity of the heart sounds.

We may sum up the treatment of prolapse by saying, that unless the life of the fetus has been seriously compromised by asphyxia, we must relieve the cord from present and future obstruction, or we must extract at once. If the head is engaged and the conditions of the soft parts permit extraction, the forceps are called for and a rapid delivery effected. If the head is movable at or above the pelvic inlet, and there is no threatened or actual rupture of the uterus, a podalic version is indicated. If the

child is dead, or its life seriously affected, a natural delivery of a still-born infant may be awaited, or embryotomy performed. These operations are admitted by all obstetric surgeons, and their permanence in the treatment of this condition has been established. The serious aspect of these cases occurs when the cord has prolapsed below the head in the first stage of labor. This is the time when we must relieve the cord from pressure or lose the child, as we are not able to extract.

It is evident that our success in these difficult cases depends upon our ability to protect the cord from pressure until the cervix is fully dilated. It is a well-known fact that the danger to the fetus is reduced to a minimum as long as the membranes are intact, though a few cases occur in which harmful, and even fatal, compression of the cord can take place in the intact bag of waters. The child is immediately placed in serious danger as soon as the liquor amnii escapes, showing that *the presence of the fluid in the uterine cavity is the great protector of the cord.* If the child's head closely fits the pelvis and the lower uterine segment, only the fluid between the head and the external membranes will be lost, and the remainder of the liquor amnii, above the head, will be retained until the body is expelled. But in these normal cases, prolapse does not usually occur. There is nearly always some maladjustment whereby the cord can slip past the head and seriously jeopardize the child's life. In these cases, there is but little to prevent that portion of the fluid above the head from escaping, and the uterus is nearly drained of its liquor amnii. No record has ever been made of the amount of liquor amnii which has escaped, after the body has been extracted, in cases complicated by prolapse of the cord, but in the cases that the author personally attended there was little if any liquor amnii remaining in the uterus. As the fluid drains away, the uterine walls close down upon the body of the fetus and compress it directly.

Is the cord able to escape harmful pressure in this "dry" condition of the uterus? I do not believe that it is possible in many cases. The ideal position of the cord in utero is on the abdominal surface of the body, protected by the arms and limbs of the fetus. Inasmuch

Fig. 1. Perfect adjustment between the head and lower uterine segment. (Bumm.)

as the distance between the navel and the insertion of the cord into the placenta, which lies directly opposite, is not very great, it follows that there must be considerable coiling of the cord in this region of the uterus. There are always extra coils of the cord present before a prolapse occurs. Where the liquor amnii is scanty or absent, we would expect some of the coils to be compressed when we remember that in threatened asphyxia the fetus jerks its limbs about in various directions, pushing out the uterine wall, if relaxed, and permitting a displacement of the coils to a position where harmful pressure may result. When the membranes are intact, the contraction of the uterus offers little opportunity of changing the position of the cord, and inasmuch as the general intrauterine pressure is equal, and opposite in direction, the different degrees of tension do not

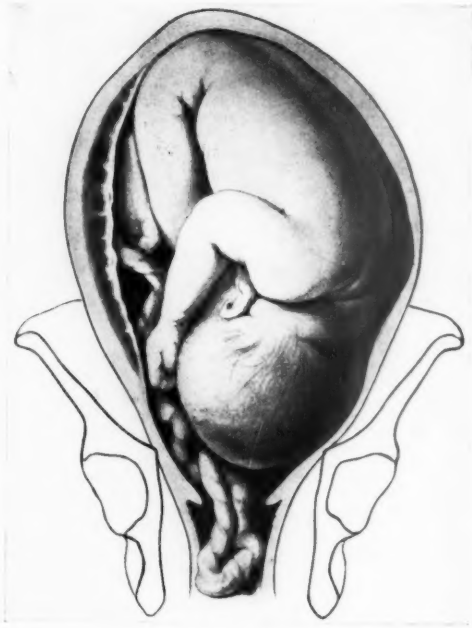

Fig. 2. Prolapse of the cord. (Bumm.) Maladjustment between the head and lower uterine segment.

affect the cord. When the integrity of the ovum is destroyed, the contraction of the uterus forces the cord in the direction of least resistance, or toward the cervix, and as the fluid wedge is now lost, the cord is apt to be pushed from its place of security to a position of danger.

When the cord does prolapse, it usually falls down opposite one of the sacro-iliac synchondroses. This is due to the fact that the navel is usually close to the posterior wall of the uterus. As the placenta is also found on the posterior wall, in a large number of cases, we see that both the fetal and placental ends of the cord lie posteriorly. As the abdomen of the fetus lies either to the right or left, we would expect the cord to prolapse in the direction of least resistance, or along the side of the head. If the diagnosis was occipito-læva-anterior, the cord would fall more frequently in the left and posterior quadrant of the pelvis, and sometimes in the right and anterior portion. It is rare to find the cord under the os pubis, and this position is dangerous unless relieved by art. No record has been made of the location of the prolapse, in this series, so that no deductions can be made on that point.

The essential point in the treatment is to preserve the cord from pressure. The various methods used are divided into posture, reposition by catheters or bougies, manual reposition, and the introduction of foreign bodies into the uterus to block the way of a recurrence of the prolapse.

Posture has been used as a treatment of prolapse from the time when the accident was first mentioned in the literature. The knee-chest position, while first practiced in the early centuries was first used in the treatment of prolapse by v Deventer (14), in 1701. This author placed the patient on that side where the cord did not prolapse, pushed up the head with the hand, replaced the cord, and then either brought the head again into the pelvis or did a version. John Mowbray (15) placed the woman in the knee-chest position if the cord was found over the sacrum or os pubis. Henry Bracken (16) replaced the cord in head labors, with the woman on the knees and elbows, and then brought the head over the inlet. Ludwig Wilhelm von Knoer (17) placed the woman in the knee-chest position, to prevent a protrusion of the cord, while he did a podalic or cephalic version. Kiestra (19) placed the woman on her knees and chest, when a fore-lying cord was felt, to prevent a prolapse, and after prolapse to facilitate the return of the cord, and kept her there until the head was well engaged. v Ritgen in 1820 (18), and in 1855 (21), cautioned the midwife that if she found the cord fore-lying, she should get the patient into the knee-chest position for a few minutes. If the patient is too weak, or suffers severely from congestion of the brain, she may lie on the side with the pelvis raised, on that side where the cord did not prolapse. If the cord has gone back, the position is necessary to prevent its return. The gradual escape of the liquor amnii is also advised. Brothers (22) places the patient on the back, over an inverted kitchen chair placed on the bed. Thomas (20) also recommended the use of posture, and popularized its employment in this country. I believe that while the knee-chest position is theoretically better where the cord pro-

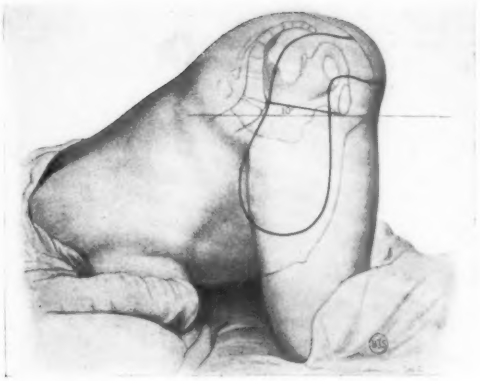

Fig. 3. Knee chest position. (Edgar.)

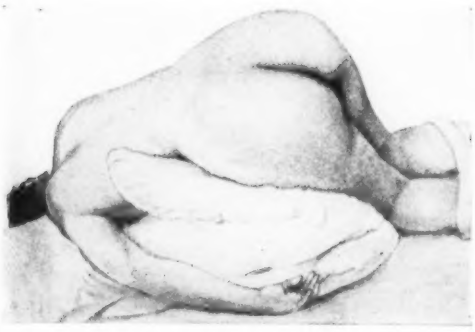

Fig. 4. Lateral prone position. (Edgar.)

lapses in the posterior portion of the pelvis, still very few women are able to maintain it for any length of time; but if they are placed on their back over an inverted chair, they can lie for hours without much discomfort.

Posture alone may replace a fore-lying cord, as happened in Case 38 of this series. It will to a certain extent retain the liquor amnii, prevent pressure of the cord, and prevent any further protrusion from the cervix. The fundus of the uterus becomes the most dependant part of the abdominal cavity and, according to Spiegelburg, the cord is as liable to slip back into, as it was in the first instance to slip out, of the uterus. The use of posture, the Trendelenburg position, the knee-chest, and lateral positions, is very valuable in the treatment of prolapse, and should be used in every case unless a rapid delivery is called for. I believe that much of the value of posture, when tried early, is due to the retention of the liquor amnii in the uterine cavity and the consequent relief from pressure.

Reposition of the cord was first suggested by Louise Bourgeoise (23), in 1609, in the attempt to place the cord above the zone of danger, while the conditions for the extraction were not yet present. Since his day many authors have used the method, but without reducing the great fetal mortality. Reuter (23), for example, collected 340 cases, from 1860 from eight different authors, of version with a fetal mortality of 28.2 per cent, while 247 cases of reposition gave 41.3 per cent. The dangers to the fetus in reposition are evident. We know that much handling of the cord is hazardous to the fetus, and frequent attempts at reposition, if persisted in, may act injuriously on the child. In displacing the head by the hand, we allow the remainder of the liquor amnii to escape if any remained in the uterus. The advice to hang the cord over a knee, as first recommended by Croft, in 1786 (24), is bad, for if the cervix is dilated sufficiently for the internal hand to reach the knee with the cord in the grasp of the fingers, it is open enough to perform a version. If the fetus is very active, or the uterine contractions are strong, there is great difficulty in keeping the cord above the head. It often happens that with the attempts at reposition, more of the cord falls down into the vagina.

When the cervix is not sufficiently dilated to allow of manual reposition, many instruments have been used to replace the cord. The oldest is that of von Dudan, in 1826. Others have been invented by Kiwish, Roberton, Braun, Scholler, Varges, and Charpentier (26). The greater num-

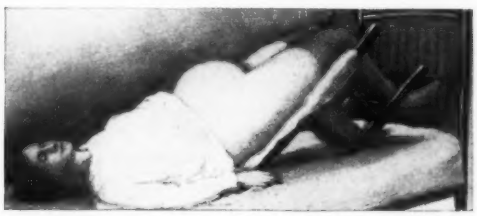

Fig. 5. Trendenlenburg position. (Garrigues.)

Fig. 6. Manual reposition of the cord. (Edgar.)

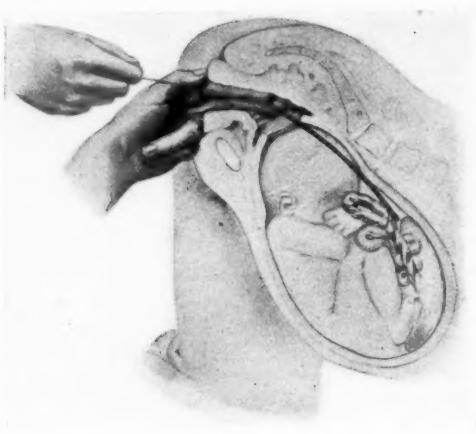

Fig. 7. Reposition by the catheter. (Edgar.)

ber of these instruments consists of a catheter, or bougie, and a stylet. A ring of tape is passed around the cord, and then caught by the stylet through the fenestrum and the end of the catheter. The patient is placed in the knee-chest position, the head pushed aside, if movable, and the cord and catheter pushed as far up as possible. The stylet is now withdrawn, the cord released, and the head brought over the pelvis. In other cases, the catheter is allowed to remain in the uterus until the fetus is delivered. The main trouble with this method is that retention is very difficult, and we usually see the cord slip down again. There is no pressure to counteract the fetal-axis pressure, and as the cord moves in the direction of least resistance, it slips toward the cervix.

Reposition with the hand is most successful when the child is in good condition; when the head is displaceable and yet fits the inlet; where there are no marked degrees of deflexion that cannot be rectified; where there is no marked deformity of the pelvis, except the generally contracted pelvis; and where the cord has not been prolapsed for a long time. If the membranes are intact, every care should be taken to preserve them until the cervix is effaced and dilated, as any attempt to replace by direct means is fraught with great danger of premature rupture, and the prognosis for the child is more serious. Efforts to place the patient in the side position, with the hips raised; the use of the Braun metreurynter partially filled in the vagina, as recommended by Fritsch; and the avoidance of all bearing-down efforts; are beneficial. Reposition is useless if we are unable to push the cord beyond the greatest diameter of the presenting part. Even when the cord has been successfully replaced, many cases occur in which the fetal heart tones get slower and slower, and the child finally dies. Here, either the damage to the cord and circulation during the period of prolapse has been too great, or there is compression after the cord has been replaced. I believe the latter condition obtains when the fetus is fairly vigorous at the time of reposition.

The ideal condition, during the first stage of labor, consists of the presence of a normal amount of liquor amnii in the uterine cavity and the intact membranes. Reposition by the hand or catheter does not restore the ideal condition, because the fluid is absent or scanty. We must replace the liquor amnii with a sterile solution, and provide a substitute for the ruptured bag of waters. Schroeder (27) has his assistant press firmly on both sides of the lower uterine segment, against the head, in cases of suspected presentation of the cord, so as to lessen the space below and around the head. He ruptures the membranes with a

needle, and allows a gradual escape of the liquor amnii. As the head comes down and completely fills the inlet, the opening is widened. The assistant holds the head against the inlet for two or three pains.

Henne (28) reports the case of a cord 130 cm. long, with a low insertion. The cord was down and the cervix partially dilated. He took a piece of gauze 2.5 cm. wide, packed the cord past the head, and then pressed the head into the pelvis. After the chloroform was taken away, the pains returned and a living child was born two hours later. This is one way of counteracting the intra-uterine tension.

Blundell (29) recommends to take a sponge, about the size of the four fingers, and pack it into the cervix to retain the cord after it has been replaced. This method was also used by Osiander, Busch, Hughes, and Hopkins.

Schmeisser (30) fastened the loop of the cord to the base of a properly constructed bag. The bag was then passed into the uterus, inflated with air and so retained.

Ashford (31) used a Gariel's air pessary, attached to the cord by a piece of tape. After the bag and cord were passed into the uterus, the bag was filled with air and kept there until the head came down into the pelvis, when the air was released. Ashford saved the child by this method.

De Lee (32) recommends, in cases where the arm has prolapsed along the head, to place it within the loop of the cord so that it will be preserved from pressure. The labor is allowed to proceed normally, and if indications arise calling for the rapid termination of labor, to extract. In case 16 of this series, this method of treatment was followed out by him, and a living child was later delivered by forceps.

In my search of the literature, I have been unable to find the record of any one attempting to restore the normal conditions of the first stage of labor by introducing into the uterine cavity a fluid to take the place of the liquor amnii, and providing a substitute for the membranes. A very excellent substitute for the membranes is the metreurynter. The great objection to the Braun instrument is the elasticity of its walls, that allows it to slip out of the cervix before the os is fully dilated. I have devised

Fig. 8. Showing the instrument in operation.

a new instrument[1] by taking as a model the Voorhees bag, which is more inelastic and is easier to retain in the cervix. It also holds the liquor amnii from leaking, better than any of the other instruments. There are two sizes; the smaller bag has a basal diameter of 6 cm., and is 8 cm. from base to apex; the larger size has a diameter of 10½ cm. at the base, and is 10 cm. from base to apex. Through the bag, running from base to apex, is a separate rubber tubing that has no connection with the interior of the bag. Fluid forced through this tube passes directly through the bag and appears externally at the base. At the opening of this tube, in the base, are two small masses of rubber intended to prevent the presenting part from pressing directly against the aperture and obstructing the flow. The larger bag is used in all cases where it is possible to introduce it above the cervix, as the necessity of changing the bags during the first stage is undesirable. If it is impossible to use the larger bag, the smaller one is used until the cervix is better dilated. When the large bag

[1] These instruments are manufactured by Sharp and Smith, Chicago.

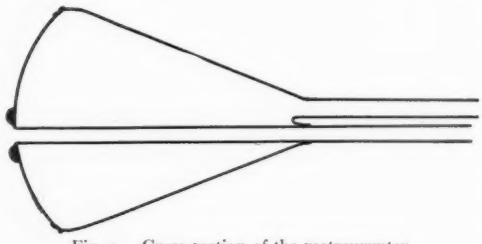

Fig. 9. Cross-section of the metreurynter.

pulls out, the conditions are present for an immediate extraction.

The instrument is rendered aseptic by boiling. It is used in the following manner: As soon as a diagnosis of prolapse is made in the first stage of labor, no time should be lost in placing the patient in the Trendelenburg position over the back of a chair. If the pains are vigorous, chloroform may be administered to produce relaxation of the uterus, to prevent pressure on the cord, and also to keep the cord from protruding further into the vagina. After boiling the instrument and preparing the field of operation, the bag is filled with a half-per-cent lysol solution. This solution is then expressed, with the tube under water and clamped with an artery forceps. The cord is now replaced, manually, and pushed up past the head; or if this is impossible, the catheter is used. The bag is now folded upon itself and introduced into the uterus above the cervix. It is then filled nearly full by Davison's bulb syringe. Sterile salt-solution is now injected slowly through the other tube. The quantity necessary to inject, varies in different cases. Generally, one pint is sufficient, but some allowance must be made for leakage. If the leakage is too free, the bag should be filled to its full capacity. After the salt-solution has been introduced, the chloroform is taken away, and the pains are allowed to return. If the abdominal wall is of medium thickness, it is possible to ascertain the necessary amount by palpation of the uterus. If the uterus has been overfilled, the pains become constant and very vigorous, similiar to those occurring in a threatened rupture of the uterus. The release of a portion of the uterine fluid will cause this symptom to disappear. The danger of producing a rupture of the uterine wall is small. Rupture is due, in the great majority of cases, to a localized pressure, and not by a generally equalized pressure, such as this fluid would cause. The method is used only in the first stage of labor, when the uterine walls have not been exhausted by a long and tedious labor. I do not believe that sufficient pressure would be brought to bear, to cause a rupture before the same pressure would force the fluid between the bag and cervix, and hence the condition would spontaneously relieve itself.

Should considerable leakage occur, the deficiency may be made up by the introduction of more fluid through the tube. Excessive leakage may be prevented, at least in part, by plugging the vagina with wet cotton. It is unneccessary to add that auscultation of the fetal heart should be made at frequent intervals, to ascertain the condition of the child. In the meantime, preparations for a version should be made, so that as soon as the os is well dilated the child may be delivered immediately. All means for the resuscitation of the child should be at hand. If it is thought necessary, we may keep the patient in the Trendelenburg position during the entire period of this special treatment. If it is impossible to replace the cord or to retain the bag above the cervix, the treatment is posture only, and the fetal mortality is raised accordingly.

The contra-conditions for the use of this method are as follows:

1. The life of the fetus must not have been seriously endangered by a long-continued compression of the cord. The child should be able to withstand a certain amount of shock in the final operation.

2. The pelvis must not be deformed to such an extent as to contraindicate the use of the forceps, or the performance of version and extraction.

3. There should be no tumors large enough to interfere with the mechanism of labor.

4. The fetus should not be a monster nor be incapable of extra-uterine life.

5. The prolapsed cord must be pushed back of the largest diameter of the presenting part.

6. The instrument should not be used when deep lacerations, or a previous amputation of the cervix, allow of too free a leakage.

7. The cervix should not be dilated, and an

immediate delivery of the fetus should not be threatened.

In conclusion, I would say that the ideal treatment of prolapse of the umbilical cord, in the first stage of labor, has never yet been carried out. It includes the restoration of the conditions present in normal labor, the integrity of the membranes, and the presence of the liquor amnii or a similiar fluid in the uterine cavity.

The cord is relatively immune from harmful pressure during the period when the ovum is intact. This immunity exists even when the cord presents in front of the fetal head. In the great majority of cases, the cord is immune from harmful pressure as long as the membranes are intact, no matter where it may be situated. The danger to the fetus is markedly increased the moment the membranes rupture, and active efforts must be instituted to prevent pressure of the cord, or the child is usually lost. In these cases, not only the fore-waters, but all, or nearly all, of the remainder of the liquor amnii are lost, because the same conditions that allowed the cord to prolapse, provide for an escape of fluid above the presenting part. In many of the cases of supposedly successful reposition of the cord, the fetus dies because pressure is still present, although no direct point of pressure can be recognized by the palpating hand.

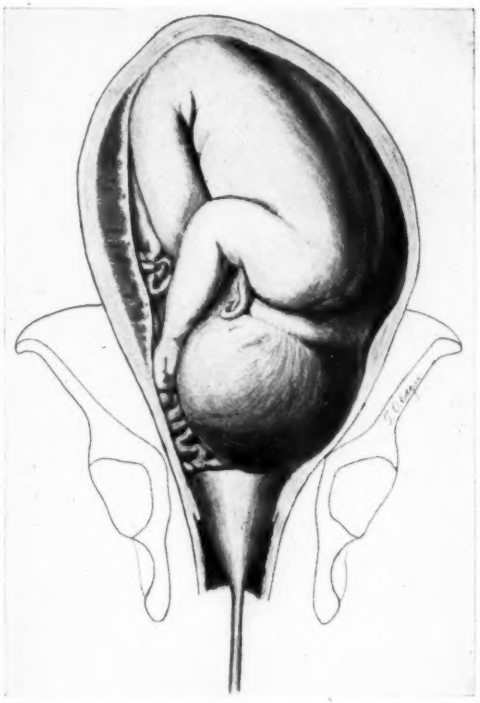

Fig. 10. Recurrence of the prolapse and compression after manual reposition. Absence of liquor amnii in uterine cavity.

The high fetal mortality has held its own for generations, and from a third to a half of the children have perished in spite of our best efforts to save them. All the former methods of treatment have not restored the normal conditions existent in the first stage of labor. The liquor amnii is the great protector of the cord. It distributes the intra-uterine tension equally and prevents any direct pressure on the cord. When the integrity of the ovum is destroyed, all the contents of the uterus are propelled toward the cervix. The liquor amnii, and the cord, are alone movable, and if the relations between the lower uterine segment and head are abnormal, they will escape. There is no disposition on the part of the cord to become displaced if the tension is equal and opposite, in all directions. The objection to reposition alone is that the cord is being continually forced toward the cervix by the uterine contractions, because of the absence of that pressure that acts in the direction from the cervix to the fundus. The introduction of fluid in the uterine cavity, and its retention by the metreurynter at the os uteri, restores the counterpressure on the cord, and removes any tendency for it to move toward the cervix. The presence of fluid in the uterine cavity prevents any direct pressure between the fetal body and uterine walls. The introduction of fluid into the uterus is not dangerous if proper care is taken. Any excess will leak out before a rupture occurs.

The ideal final operation is version, and the fluid prevents the uterine walls from closing down on the child and so rendering a version impossible.

The following forty-eight cases of prolapsus funis have occurred in the hospital and dispensary service of the Chicago Lying-in Hospital since its organization in 1895.

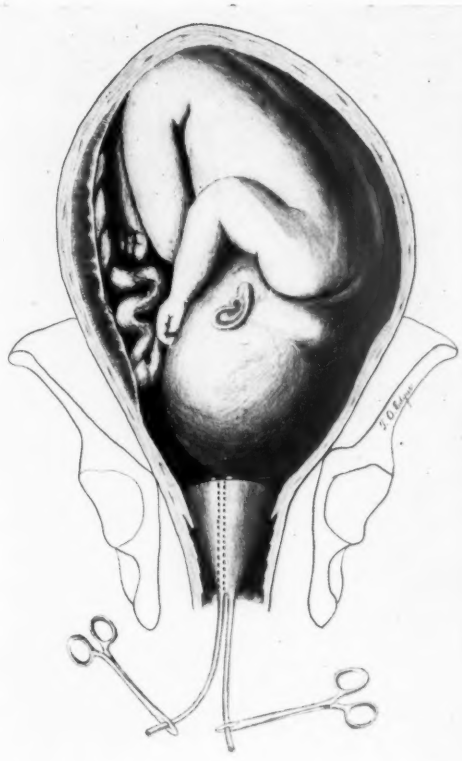

Fig. 11. The hydrostatic action of the fluid in the uterine cavity tends to prevent a recurrence of the prolapse and the danger from pressure on the cord is minimized.

I am indebted to Dr. Joseph B. De Lee, medical director of the institution, for the privilege of reporting these cases.

Most of the patients were Russian Jewish women and were of that class who inhabit the slum districts of Chicago. They nearly all suffer from overwork and frequent pregnancies, and are poorly nourished and debilitated. They often delay calling for assistance until well along in labor, and, when the cord has prolapsed, until the child's life is in great danger. The calls at the Dispensary are answered by an intern and a senior medical student. The diagnosis of prolapse of the cord being made, a hurried call was given to a member of the operating staff, and an hour was required for him to get to the house of the patient. Meanwhile, the intern endeavored to prevent compression of the cord by placing the patient over the back of a chair, by the use of the knee-chest position, or, if the child was dying, by a manual reposition. As a consequence of these delays, the operator frequently found the child in a dangerous condition. Many of the operations were done because a feeble pulsation was felt in the cord, and the child was given the benefit of the doubt. Out of fifty-one cases, the condition of the fetus was found impaired in thirty-two instances.

These results should be improved upon in private practice, where the obstetrician is called earlier to his cases and the long delays, necessary in dispensary practice, are obviated.

No mothers were lost in the series, and there was no temperature or infection in any case. This result is due to the rigid routine of antisepsis that is carefully followed by all who have to do with the lying-in woman.

Case 1. Miss P. Para 1. Age 29. Hosp. No. 107. The patient started in labor November 20, 1900. *Diagnosis:* Occipito-læva-anterior. The fetal heart tones varied from 108 to 68 during the second stage of labor. The membranes ruptured spontaneously and immediately the cord prolapsed into the vagina. The liquor amnii was stained with fresh meconium showing the presence of a threatened asphyxia. Forceps were applied to the head and the child quickly extracted. The baby, a boy, was markedly cyanosed but resuscitation, though difficult, was finally successful. Considerable mucus was removed from the pharynx by the tracheal catheter. The child weighed 6.5 pounds and was fully matured. The cord was 58 cm., long and was inserted into the placenta eccentrically; the opening in the membranes was lateral. Labor lasted seven hours and thirty-five minutes. No pelvic measurements were recorded. This case shows that asphyxia may occur from pressure on the cord in the intact membranes. The head was well down on the pelvic floor before the membranes ruptured, and the short period of labor would in all probability dispose of direct compression of the fetus by the uterine walls.

Case 2. Mrs. S. Para v. Age 33. Hosp. No. 438. Last labor instrumental. Labor began May 30, 1903. *Diagnosis:* Occipito-dextra-posterior. The pelvic measurements were: IS, 27.5 cm.; IC, 27 cm.; Bi Tro., 31 cm.; Ext. Conj., 17.5 cm.; CV. estimated 7.75 to 8 cm.; BI Isch., 11 cm.; A funic souffle was heard at the level of the navel and on the right side. The fœtal heart tones were from 135 to 150 and regular. The membranes were ruptured spontaneously in the first stage and the cord was found prolapsed. The cervix was partially dilated artificially and the cord replaced, with the woman in the lithotomy position. She was then placed in the knee-chest posture, the hand

being in the uterus, and a more complete reposition made. She was placed in bed for four hours. At this time the head had moved over into the left iliac fossa, and the first sound of the heart had become impure. There were no uterine pains. Internal version was done, after which the pulsations in the cord quickly ceased, notwithstanding the cord was placed in the child's groin, and no point of pressure or constriction could be located. Rapid extraction could not be done because the cervix was not fully dilated. A slow extraction was made and a dead baby delivered. The fetus was a male, mature, weighed 8.75 pounds and was 50 cm. long. The cord was 56 cm. long; the insertion was central; the placenta was situated partly in the lower uterine segment and was removed manually. The cause of the prolapse was due to the flat rachitic pelvis.

CASE 3. Mrs. R. Para III. Age 27. Disp. No. 344. The two previous labors were complicated by prolapse of the cord. Labor started September 5, 1896. *Diagnosis:* Occipito-læva-anterior. Pelvic measurements: IC, 29.5 cm.; IS, 27.5 cm.; BiTro., 33.5 cm.; and Ext. Conj., 18 cm. The patient is short and very obese. After the woman had been in labor for sixteen hours, the membranes were ruptured artificially, and a profuse amount of liquor amnii escaped, carrying down a long loop of the cord. As the head was movable at the pelvic inlet, and the cervix was fully dilated, a podalic version was at once performed. The posterior leg was brought down as it was the one nearer to the internal hand. The child's back rotated posteriorly and then across the sacrum to the os pubis. The extraction was not difficult and a living baby was delivered. The child was a girl, weighed eight pounds, measured 52 cm., in length and was fully matured. The cord measured 60 cm.; the insertion was eccentric; and the opening in the membranes was lateral. Labor lasted seventeen hours and fifteen minutes. The prolapse in this case was due to the slightly flat pelvis and the large amount of liquor amnii.

CASE 4. Mrs. M. Para X. Age 35. Disp. No. 605. Labor began February 11, 1897. The case was seen for the first time during the second stage of labor. No diagnosis was recorded. Pelvic measurements: IS, 24 cm.; IC, 26.5 cm.; BiTro., 28 cm.; Ext. Conj., 18.75 cm.; Circum., 82 cm. The membranes ruptured spontaneously soon after the arrival of the intern, the head was found high in the pelvis, and the cord prolapsed into the vagina. A podalic version was done at once, and a third-degree laceration of the perineum resulted from the rapid extraction. An eight-pound girl was delivered, suffering from asphyxia pallida, and was resuscitated with difficulty. The tracheal catheter, hot baths, La Borde's tongue tractions, and Schultze's swings were used. The cord was 50 cm. long. The perineum was repaired at once. The prolapse was due to the generally contracted pelvis, which caused the head to remain high in the pelvis until late in the labor.

CASE 5. Mrs. S. Para V. Age 31. Disp. No. 805. The previous labors were easy. No miscarriages. *Diagnosis:* Occipito-læva-anterior. Labor occurred June 13, 1897. Pelvic measurements given were: CD, 12.5 cm.; CV, 10.5 cm. In the first stage, the fetal heart tones numbered 145 beats to the minute. The membranes ruptured spontaneously two hours after the cervix was dilated. The liquor amnii was stained with meconium. The head was high. A spontaneous delivery took place ten minutes after the liquor amnii escaped. The cord had prolapsed slightly. No special treatment was given as the progress of labor was rapid at this time. The little girl was deeply asphyxiated (asphyxia pallida), and was slowly revived. She weighed seven pounds and was 47 cm. long. The cord measured 72 cm., and was inserted into the placental margin. Labor lasted thirteen hours and twenty minutes.

CASE 6. Mrs. T. Para I. Age 20. Disp. No. 1080. The interne was called and arrived during the second stage. The child presented by the breech and one foot of the cord had prolapsed. There was only slight pulsation. The patient was immediately placed in the Trendelenburg position while preparations were being made to deliver. Both feet presented. The sacrum rotated to the os pubis. Both arms were stripped over the head. A rapid extraction delivered a dead, female infant, eight pounds and a half in weight, 52 cm. long and well developed. The cord was 72 cm. long, insertion marginal, the opening of the membranes was lateral. No pelvic measurements were recorded. Labor lasted eight hours and forty minutes. This prolapse was due to the footling presentation and the asphyxia was so severe, at the arrival of the intern, that any treatment would have been of no avail. It was a case of being too late.

CASE 7. Mrs. L. Para III. Age 30. Disp. No. 1159. *Diagnosis:* Occipito-læva-anterior. Fetal heart tones were 140 and regular. No funic souffle. Pelvic measurements: IS, 25 cm.; IC, 28 cm.; BiTro. 30 cm.; Ext. Conj., 20 cm.; Circum., 85 cm. The head was engaged but movable. No fore-lying cord found in the first stage. In the second stage, the cord was felt. The heart tones were still 140 and regular. Pains were weak and there was no progress. The membranes were ruptured artificially, and a version and extraction was done at once. The baby, a female, was slightly asphyxiated. She weighed seven and a half pounds, was 50 cm. long and matured. The cord was 52 cm. long; insertion eccentric; opening of the membranes lateral. Duration of labor, fifteen hours and forty minutes.

CASE 8. Mrs. L. Para VIII. Age 38. Disp. No. 1214. *Diagnosis:* Mento-læva-anterior. Pelvic measurements: IS, 25 cm.; IC, 28.5 cm.; BiTro., 29 cm ; Ext. Conj., 18 cm.; Circum., 90 cm. The heart tones were 136, regular and heard to the right of the navel. The membranes ruptured spontaneously and four inches of the cord prolapsed through the cervix. The liquor amnii was clear. The fetal heart tones gradually grew more rapid, but as the pains were strong and frequent, and the progress of labor rapid, the cord pulsating well, nothing was done and soon a male babe was delivered spontaneously, but suffering from asphyxia pallida. He weighed six pounds and measured

54 cm. The cord measured 54 cm.; insertion was eccentric; the opening in the membranes was lateral. Labor lasted twelve hours and forty minutes. The face presentaion was the primary cause in this case.

CASE 9. Mrs. O. Para III. Age 27. Disp. No. 1254. The first child was delivered with forceps; the second labor was normal. *Diagnosis:* Occipito-dextra-anterior. Labor occurred February 2, 1898. The intern arrived in the second stage. The uterine pains were severe, the head movable and the fetal heart tones 136 and regular. There was no funic souffle. The membranes ruptured spontaneously, and a large amount of liquor amnii escaped. There was no meconium. The cord prolapsed about eight inches. The staff operator found the head engaged, and the cord still prolapsed and pulsating. The pains were severe. A living child was extracted with the forceps. The baby was a male, weighed nine and a half pounds, and was matured. The cord was 112 cm. long, and contained many false knots. It was not coiled around the child's neck. The opening in the membranes was large and lateral. Duration of labor twenty-six hours and a half. The interesting features in this case were the hydramnion, and the great length of the funis.

CASE 10. Mrs. C. Para XI. Age 40. Disp. No. 1453. The first child died at birth. *Diagnosis:* Occipito-dextra-posterior. Pelvic measurements: IS, 26 cm.; IC, 29 cm.; BiTro., 29 cm.; Ext. Conj., 20 cm.; Circum., 85 cm. The fetal heart in the first stage beat 160 and regularly. The bag of waters ruptured spontaneously in the first stage, and the cord immediately prolapsed. The patient was placed in the knee-chest position for ten minutes, and then in the Trendelenburg position for forty-five minutes. The cervix was not completely dilated and a Braxton-Hick's version was performed. After the version, the fetal heart tones disappeared. Nature was allowed to take its course and a dead, female baby was born spontaneously, about three hours later. The babe weighed seven pounds and was 54 cm. long. The cord was 79 cm. long; insertion eccentric; and opening lateral. Duration of labor, seven hours and fifteen minutes. After the version, the pressure on the cord continued and the child immediately perished.

CASE 11. Mrs. E. Para VIII. Age 35. Disp. No. 1494. All the previous labors were normal. Labor, June 6, 1898. *Diagnosis:* Occipito-læva-anterior. Pelvic measurements: IS, 24 cm.; IC, 27 cm.; BiTro.; 29 cm.; Ext. Conj., 19 cm.; Circum., 82 cm. The fetal heart tones were not heard during the labor. The head was movable in the inlet. The membranes ruptured spontaneously and prolapse of the cord recognized. There was no pulsation. The liquor amnii was stained with fresh meconium. Spontaneous delivery occurred in half an hour. The baby was a boy, weighed eight pounds, was 52 cm. long and mature. The cord measured 72 cm.; insertion eccentric, many false knots; the opening was lateral. Duration of labor, ten hours and ten minutes. This baby, in all probability died in the early part of labor.

CASE 12. Mrs. K. Para V. Age 32. Disp. No. 1601. History of one prolapse and one version in former labors. *Diagnosis:* Occipito-læva-anterior. Labor, August 8, 1898. Pelvic measurements: IS, 23.5 cm.; IC, 28 cm.; BiTro., 31 cm.; Ext. Conj., 19 cm.; Circum., 90 cm. Fetal heart tones 140 and regular. The membranes ruptured spontaneously at the close of the first stage. The liquor amnii was clear. Pains were weak. The cord had prolapsed three inches. The patient was placed in the Trendelenburg position, and the cord was found to have slipped back two inches and still pulsating. Version was done four hours after the membranes had ruptured. The heart tones at this time had become weak. The extraction was difficult. The child lived two days, during which time, he spit up large quantities of bloody mucus. He weighed nine pounds and was 51 cm. long. The cord was 48 cm. long; insertion was eccentric; and opening lateral. Help came too late in this case.

CASE 13. Mrs. R. Para XII. Age 43. Disp. No. 1650. Former labors were normal. *Diagnosis:* Occipito-dextra-anterior. Pelvic measurements: IS, 22.5 cm.; IC, 27 cm.; BiTro., 29 cm.; Ext. Conj., 19 cm. In the first stage, examination disclosed placental tissue over the cervix, and a pulsating vessel on its posterior surface. The fetal heart tones were 140 and regular. Progress of labor slow. The membranes were ruptured and the liquor amnii was allowed to escape slowly. The cord was found prolapsed. The fetal heart tones rose to 160 and higher after the amniotic fluid escaped. The liquor amnii was clear. Spontaneous delivery occurred while preparations were being made to deliver with the forceps. The final diagnosis was placenta-prævia-marginalis, velamentous insertion, and prolapse of the cord. The baby, a girl, was alive, weighed six pounds and was 45 cm. long. The cord was 53 cm. long, and the opening in the membranes was marginal. The primary respirations were delayed for fifteen minutes. Labor lasted fifteen hours and twenty minutes.

CASE 14. Mrs. P. Para VI. Age 30. Disp. No. 1768. Former labors were tedious and hard. Three babies were born dead. The last was a forcep operation. Labor, December 20, 1898. *Diagnosis:* Scapula-læva-anterior. The fetal heart tones varied from such a rate that they could not be counted down to 140 beats a minute. Pelvic measurements: IS, 24 cm.; IC, 27 cm.; BiTro., 30 cm.; Ext. Conj., 20 cm. Through the intact membranes, the hand was palpated. The contraction ring of Bandl was felt, one finger's breadth below the navel. The membranes were torn artificially, when the cord prolapsed and was pulsating slowly. The liquor amnii was stained with meconium. Podalic version was performed and a difficult extraction followed. The patient was placed in the Walcher posture, and the head came through the inlet, under strong external pressure, with a "slump." The fetus was moderately asphyxiated. There was a spoon-shaped depression on the right parietal bone. The child was a female, weighed six pounds and was 48 cm. long. The cord was 49 cm. long; the opening in the membranes was lateral, the insertion eccentric. The primary respirations were delayed for five minutes.

CASE 15. Mrs. H. Para II. Age 28. Disp. No. 1810 The last child died at birth from unknown

causes. Labor began November 14, 1898. Pelvic measurements: IS, 27 cm.; IC, 29 cm.; BiTro., 30.5 cm.; Ext. Conj., 19 cm.; Circum., 85 cm. The fetal heart tones numbered 120. The fore-lying cord was felt running across the cervix which admitted two fingers. The patient was placed in the Trendelenburg position for two hours. At this time, the head was freely movable. After two hours, the cord had disappeared. The membranes were then ruptured and version performed. There was considerable hemorrhage during the operation. The liquor amnii was stained with meconium. A posterior-parietal-bone presentation was detected. A rapid extraction was made because of the slowing of the fetal heart. Subsequent examination showed an incomplete rupture of the uterus on the left side, one and a half inches in length, going into the left broad ligament. Both mother and child recovered, though it required fifteen minutes to revive the child. The baby was a boy, weight seven pounds, length 48 cm. The cord was 53 cm. long, and the insertion was lateral. In this case, the Trendelenburg position alone was responsible for removing from the child the danger of a prolapsed cord.

Case 16. Mrs. B. Para IV. Age 32. Disp. No. 1879. Labor came on December 26, 1898. *Diagnosis:* Occipito-dextra-anterior. The pelvic measurements were not taken but were probably normal. The membranes ruptured spontaneously when the cervix admitted three fingers. The liquor amnii was clear. There was a prolapse of the cord and the left arm. The pulsation in the cord was slight. Dr. De Lee adjusted the cord on both sides of the arm, so that pressure would fall on the arm itself. After this adjustment, the pulse became stronger. The uterine wall was firmly contracted around the child's body. The patient was placed in bed to await a normal delivery, unless the heart tones would indicate a rapid delivery. Later, the pulsation became weak and rapid, and the forceps terminated the second stage. The cord was around the neck twice. The babe was alive, a male, weighed seven and a half pounds and measured 50 cm. in length. The cord was 66 cm. long; the insertion eccentric; and the opening of the membranes lateral. Labor lasted eighteen hours and a half.

Case 17. Mrs. P. Para X. Age 38. Disp. No. 1916. Former labors were long and painful. Labor began January 14, 1899. *Diagnosis:* Occipito-dextra-anterior. The pains were weak and irregular in the first stage. Pelvic measurements: IS, 27.5 cm.; IC, 29 cm.; BiTro., 31 cm.; Ext. Conj., 19 cm.; Circum., 95 cm. The fetal heart tones were 138 and regular. When the cervix admitted four fingers, the cord was felt in the intact bag of waters. The pains were severe, every three to five minutes, at the close of the first stage. The patient was placed in the Trendelenburg position. The membranes ruptured spontaneously soon after, and the liquor amnii was stained with meconium. External version was first attempted but in vain, and a podalic version and extraction delivered a slightly asphyxiated baby. The child was a male, weighed eight and a half pounds, and measured 51 cm. The cord was 72 cm. long; the opening was median; and the insertion was central. The duration of labor was eleven hours and forty minutes.

Case 18. Mrs. B. Para VI. Age 34. Disp. No. 2051. Former labors easy. *Diagnosis:* Scapula-læva-anterior. Prolapse of the cord, hand and foot, complicated by placenta prævia lateralis. Pelvic measurements: IS, 27 cm.; IC, 31 cm.; BiTro., 34 cm.; Ext. Conj., 20 cm.; Circum., 96 cm. Spontaneous rupture of the membranes occurred. The heart tones in the first stage were 165, and regular. The patient was delivered by a version and a slow extraction. The placenta was delivered at once. The babe was dead, a female, weighed eight pounds, and was 50 cm. long. The cord was 58 cm. in length, the opening in the membranes was marginal; the insertion was eccentric.

Case 19. Mrs. B. Para IV. Age 24. Disp. No. 2103. The first labor was operative, occiput-posterior; baby dead. The other two labors were normal. Labor began April 23, 1899. *Diagnosis:* Scapula-dextra-anterior. The pelvic measurements: IS, 24.5 cm.; IC, 28 cm.; BiTro., 32.5 cm.; Ext. Conj., 20 cm.; Circum., 92 cm. The fetal heart numbered 136 beats a minute, and was heard on the left of the navel. A fore-lying cord was felt in the cervix which admitted five fingers. The pains were strong. When the heart tones became feeble, the patient was placed on the table, and a version was performed by the intern. The version was easy and as the pulsation in the cord became very feeble, the extraction was hurried. The child was moderately asphyxiated and was revived by hot water and the catheter. The boy lived, weighed nine pounds, and was only 42 cm. long. The cord was 85 cm. in length; the insertion was eccentric; and the opening in the membranes was lateral. Labor lasted two hours and fifteen minutes.

Case 20. Mrs. A. Para. III. Age 25. Disp. No. 2397. Labor occurred October 22, 1899. The Dispensary physicians arrived during the second stage of labor. On examination, the cord was found prolapsed, and a loop eight inches in length lay outside the vulva. There was no pulsation. *Diagnosis:* Occipito-læva-anterior. The head was engaged in the pelvis and was fixed. No fetal heart tones could be heard. The membranes had ruptured spontaneously, three and a half hours previous to the arrival of the internes. The liquor amnii was stained with meconium. Normal labor was allowed to proceed and a dead baby was born an hour later. The child was a male, weighed eight and a half pounds, and measured 58 cm. The cord was 86 cm. in length, and was inserted eccentrically into the placenta; the opening in the membranes was lateral.

Case 21. Mrs. G. Para VI. Age 31. Disp. No. 2647. The previous labors were normal. Labor occurred March 29, 1900. *Diagnosis:* Scapula-dextra-posterior. The heart tones were 150 and regular. The elbow presented at the cervix. The abdomen was pendulous, the external diagnosis was difficult, and the position was determined with difficulty. Before the membranes ruptured, the fetal heart was heard on the right side, afterwards on the left. A profuse amount

of liquor amnii escaped when the membranes were ruptured artificially. The child was freely movable. The cord prolapsed about eight inches. A version was attempted, but the pulsation ceased immediately and the child died. The Karl Braun blunt hook was used, but bent in the operation, and the delivery was effected by evisceration. There was no history of the pelvis. Hydramnion and a pendulous abdomen were the probable causes in this case.

CASE 22. Mrs. P. Para VII. Age 30. Disp. No. 2908. Four previous labors were normal, two children died at birth. *Diagnosis:* Occipito-dextra-anterior. Labor occurred August 24, 1900. The fetal heart tones were 100 and irregular. In the second stage, an anterior-parietal-bone presentation was found. The membranes ruptured spontaneously, and the liquor amnii was stained with fresh meconium. The cord prolapsed, but was not pulsating. Forceps were applied and a difficult extraction made. On account of the great girth of the shoulders, a double cleidotomy was performed and the delivery effected. The cord was around the neck once. The fetus was a male, weighed ten pounds, and measured 57 cm. in length. The cord was 74 cm. long with central insertion; the opening was lateral. Duration of labor was eleven hours and thirty minutes. Though no measurements were given in this case, the prolapse was probably due to the contracted pelvis and the length of the cord.

CASE 23. Mrs. C. Para VII. Age 35. Disp. No. 2969. Former labors normal. Labor September 19, 1900. *Diagnosis:* Occipito-dextra-anterior. The fetal heart tones were 136 and regular. Pelvic measurements: IS, 23 cm.; IC, 25 cm.; BiTro., 30 cm.; Ext. Conj., 19 cm.; Circum., 80 cm. The pelvis was generally contracted. Hydramnion was present. The fore-lying cord was palpated in the first stage. The patient was placed in the knee-chest position, for half an hour, but without any effect on the cord. At this time the membranes ruptured spontaneously. The cord was now pushed back above the head, with the hand passed internally, and the head was then forced into the inlet externally, and kept there until it became engaged. This is excellent treatment in generally contracted pelves, provided the reposition can be effected. Later, the forceps were applied and a living, male child was extracted. The babe weighed eight and a half pounds, was 49 cm. long and was mature. The cord was twice around the neck. The cord was "quite long" and was inserted laterally into the placenta, the opening in the membranes was lateral. Labor lasted thirteen hours and fifty-five minutes.

CASE 24. Mrs. B. Disp. No. 3188. Labor occurred June 16, 1901. Mrs. B. had employed a midwife to attend her in confinement. Upon examination, a face presentation was discovered, and the intern was called. He attempted to do a version, but found a loop of the cord prolapsed and pulseless, and the baby dead. Later, a craniotomy was performed and the labor terminated. No further details of the case were recorded.

CASE 25. Mrs. T. Para VIII. Age 27. Disp. No. 3491. The former labors were normal and easy. There were four abortions, from seven weeks to four months. Labor began July 23, 1901. *Diagnosis:* Sacro-dextra-anterior. In the first stage, the breech was high and movable. The fetal heart tones were 160, and regular, and were heard to the right of and below the navel. The pelvic measurements were: IS, 26 cm.; IC, 30 cm.; BiTro., 31 cm.; Ext. Conj., 21 cm.; Circum., 98 cm. In the second stage, the heart tones were 180, irregular, and were heard above the navel. The uterine contractions were weak. The membranes ruptured spontaneously. Meconium was present. The cord had prolapsed to the vulva and was nearly pulseless. Extraction resulted in the delivery of a dead, male infant, eight pounds in weight and 54 cm. long. The cervix was torn to the vaginal fornix, and a severe hemorrhage necessitated a utero-vaginal tamponade. The cord measured 60 cm., and was inserted eccentrically into the placenta. The labor lasted fifteen hours and ten minutes.

CASE 26. Mrs. G. Para IV. Age 28. Disp. No. 3611. Her first labor was instrumental, the second difficult, and the third was precipitate. Labor occurred September 29, 1901. Pelvic measurements: IS, 25 cm.; IC, 26 cm.; BiTro., 30 cm.; Ext. Conj., 20 cm.; Circum., 88 cm. No diagnosis was recorded. The internes arrived during the second stage when the cord was found to be prolapsed, and lying externally to the mother. The patient was placed in the Trendelenburg position, but as she was very nervous it was difficult for her to maintain the position for any length of time. An attempt was made to replace the cord and, during the procedure, a spontaneous delivery resulted. The baby, a male, was born dead. He weighed six pounds and measured 48 cm. in length. The cord was 91 cm. long, and was centrally inserted; the opening in the membranes was central. Labor lasted eleven hours and fifteen minutes. A moderate postpartum hemorrhage responded to a hot intra-uterine douche.

CASE 27. Mrs. G. Para IV. Age 28. Disp. No. 3792. The former labors were normal. *Diagnosis:* Occipito-dextra-anterior. Labor occurred November 30, 1901. The presenting part was movable. The fetal heart tones were 130 and regular. The uterine contractions were severe. While making an examination in the second stage of labor, an accidental rupture of the membranes occurred. There was a gush of liquor amnii and a long loop of the cord prolapsed. The patient was immediately placed in the Trendelenburg position, and several attempts made to replace the cord. During these manipulations the hand also prolapsed but this member was replaced by the intern. The case was terminated by a difficult version and extraction. Both arms were in the nape of the neck. The right clavicle was fractured during the extraction. The child could not be revived. The cord was 84 cm. long; insertion was central. Labor lasted thirteen hours and thirty minutes. The baby, a male, weighed ten pounds.

CASE 28. Mrs. M. Para III. Age 30. Disp. No. 3922. The former labors were easy and normal.

Diagnosis: Occipito-læva-anterior. Labor occurred March 28, 1902. Pelvic measurements: IS, 24 cm.; IC, 25 cm.; BiTro., 30 cm.; Ext. Conj., 19 cm. The membranes ruptured in the first stage of labor, and the cord found prolapsed. Higher up in the pelvis, the right foot was also felt. The fetal heart tones were scarcely audible. The head was not engaged. In the second stage, the fetal heart tones were heard in the left, lower quadrant, numbered 140 and were regular. The uterine contractions were severe. A podalic version and extraction was made. The baby, a female, weighing five and a quarter pounds was asphyxiated but lived. She measured 48 cm. in length. The cord was 55 cm. long; Insertion eccentric; opening of membranes lateral. As the leg prolapsed later in the labor, it acted as a protector to the cord, and in a measure relieved the pressure.

Case 29. Mrs. U. Para VIII. Age 36. Disp. No. 4040. Previous labors normal. There were two miscarriages; one at three, and the other at four months. *Diagnosis:* Occipito-læva-anterior. Labor occurred June 16, 1902. The internes arrived during the second stage. The cord had prolapsed to the vulva. No pulsation. Baby dead. Delivery was spontaneous. The child weighed ten pounds, measured 57 cm. and was a girl. The cord was 140 cm. long, the longest in the series; the insertion was central; opening of membranes lateral. Labor lasted ten hours and forty-five minutes.

Case 30. Mrs. C. Para III. Age 26. Disp. No. 4243. *Diagnosis:* Occipito-dextra-anterior. Pelvic measurements: IS, 26 cm.; IC, 29 cm.; BiTro., 32 cm.; Ext. Conj., 19 cm.; Circum., 90 cm. In the first stage, the fetal heart was heard in the right, lower quadrant, regular and 142 beats per minute. After the cervix was completely dilated, the membranes ruptured spontaneously, and the cord prolapsed. The liquor amnii was clear. The cord was pulsating, 142 times a minute. The patient was placed in the Trendelenburg position and the head, which was movable, was held out of the inlet by the internal finger. The pains were weak throughout the labor. After the cervix had been dilated for fourteen hours, the membranes ruptured for seven, the staff operator arrived, found the cord pulseless and the baby dead. A craniotomy was performed. The child was a female, weighed nine and a quarter pounds, and was 51 cm. long. The treatment in this case was delayed. The child could have been saved by an earlier operation. Another case of being too late.

Case 31. Mrs. G. Para XI. Age 32. Disp. No. 4353. The previous labors were normal. Two miscarriages occurred, at three and four months respectively. *Diagnosis:* Occipito-dextra-anterior. Labor took place December 6, 1902. Pelvic measurements: IS, 28 cm.; IC 30 cm.; BiTro., 35 cm.; Ext. Conj., 22 cm. The patient was very obese, and the heart tones could not be heard during the labor. The uterine contractions were severe. The membranes were ruptured artificially, soon after the cervix was dilated, and the pulsating cord prolapsed with the liquor amnii. Considerable fresh meconium was present. While awaiting the arrival of the staff operator, the baby was born spontaneously. The child, a female, was born dead. She weighed ten and a half pounds and measured 55 cm. in length. The cord was 50 cm. long; insertion central; opening of membranes lateral. Labor lasted thirty-one hours. This child might have been saved by an earlier operation.

Case 32. Mrs. A. Para III. Age 30. Disp. No. 4434. The previous labors were normal. Labor occurred February 13, 1903. *Diagnosis:* Occipito-læva-anterior. The intern arrived during the second stage. At this time the cord was found lying in the vagina and pulsating from 120 to 160 times a minute. The head was movable and not engaged. The membranes had ruptured spontaneously. The patient was placed in the Trendelenburg position and the cord replaced by the hand. Spontaneous delivery occurred thirty minutes later. The baby was a male, weighed six and three quarter pounds and measured 46 cm. The labor was premature. The cord was 68 cm. long; insertion central; opening of membranes lateral. Labor lasted six hours and forty minutes. No pelvic measurements were recorded. The small baby, and the large pelvis, would account for the favorable outcome in this case.

Case 33. Mrs. W. Para III. Age 32. Disp. No. 4501. The previous labors were both operative. *Diagnosis:* Occipito-læva-transversa, Naegale's obliquity. Labor occurred February 21, 1903. Pelvic measurements: IS, 24 cm; IC, 29 cm.; BiTro., 31 cm.; Ext. Conj., 19 cm. This pelvis was of the simple, flat variety. The mother and child were in good condition in the first stage, the fetal heart tones were 120 and regular. After the cervix was dilated, the staff operator found the cord prolapsed and pulsating 140 times a minute. The liquor amnii was clear. A version was performed, but it was impossible to extract the after-coming head through the pelvic inlet, and craniotomy followed. A severe postpartum hemorrhage was treated by tamponading the entire birth canal. The baby was a girl, weighed nine and a quarter pounds, and was 52 cm. long. The cord was 50 cm. long; insertion central; opening in membranes lateral. Labor lasted twenty-nine hours and forty minutes. The death of this child was due to the difficult extraction through the deformed pelvis.

Case 34. Mrs. C. Para II. Age 23. Disp. No. 4535. Previous labors were normal. *Diagnosis:* Occipito-læva-anterior. Date of labor, March 10, 1903. An internal examination, during the first stage, showed the cord prolapsed on the right side of the head, which was high and movable. The saggital suture lay transversely. The heart tones were 128 and regular. The woman was placed on the left side for three hours, and then in the knee-chest and Trendelenburg postures, but there was no improvement, the cord being prolapsed as far as ever. A podalic version was then performed, but the extraction was difficult on account of the flat inlet. The right clavicle was fractured. The baby, a girl, was mildly asphyxiated. She weighed eight pounds, and was 48 cm. in length. The cord was 61 cm. long. Central insertion. Rup-

ture of membranes lateral. Labor lasted twelve hours and five minutes.

CASE 35. Mrs. R. Para III. Age 27. Disp. No. 4538. The first labor was hard and tedious, the second was easy. No miscarriages. *Diagnosis:* Scapula-dextra-anterior. Date of labor, March 12, 1903. Pelvic measurements: IS, 26.5 cm.; IC, 28 cm.; BiTro., 33 cm.; Ext. Conj., 20 cm. The membranes ruptured spontaneously in the first stage, and the cord and an arm prolapsed into the vagina. Meconium had been passing all the afternoon. Pulsation in the cord was feeble but later was absent. Podalic version was comparatively easy. The baby, a girl, was born dead. Weight, six pounds. Length, 51 cm. The cord was 51 cm. long. Insertion lateral. Opening of the membranes lateral. Duration of labor eighteen hours. Operative treatment was delayed too long to be of any use.

CASE 36. Mrs. R. Para VII. Age 33. Disp. No. 4623. One miscarriage occurred at six months. *Diagnosis:* Occipito-læva-anterior. Date of labor, May 5, 1903. The presenting part was not engaged in the first stage. The fetal heart tones were regular and 126 beats per minute. Uterine contractions weak. In the second stage, the head was movable at the time of the artificial rupture of the membranes. The cord came down to the vulva, and immediately the pulsation was only 60 and irregular. A version was performed and the baby saved. The little girl weighed eight pounds and was 50 cm. long. The cord measured 95 cm.; insertion eccentric; opening of membranes lateral. On account of a postpartum hemorrhage, the utero-vaginal tract was tamponed. This case clearly shows the protective influence of the liquor amnii. Labor lasted fifteen hours and forty minutes.

CASE 37. Mrs. A. Para V. Age 35. Disp. No. 4691. Previous labors were normal. *Diagnosis:* Occipito-dextra-posterior. Date of labor, June 29, 1903. The intern was called during the second stage. The first examination showed the cervix effaced and the os dilated. The intact membranes lay at the vulva. The head rested at the inlet. When the membranes had ruptured, the cord and a hand prolapsed. During this time the fetal pulse was regular and 120 beats per minute. The patient was placed in the Trendelenburg position, and upon the arrival of the staff operator, a podalic version and extraction was done at once. The little girl lived, weighed nine pounds and measured 48 cm. The cord was 66 cm. long; insertion central; opening of the membranes lateral. No pelvic measurements were recorded. The high arrest of the head would indicate a deformed pelvis.

CASE 38. Mrs. D. Para II. Age 21. Disp. No. 4932. Date of labor, October 30, 1903. *Diagnosis:* Occipito-dextra-posterior. Pelvic measurements: IS, 24 cm.; IC, 27 cm., BiTro., 29 cm.; Ext. Conj., 17.5 cm. In the first internal examination, prolapse was discovered. The cord pulsated freely, and the presenting part was movable. The fetal heart tones were regular and 120 beats per minute. In this instance, the patient was placed in the knee-chest position, and held there for an hour. Before the second examination was made, the cord had disappeared and was no longer palpable. The delivery was spontaneous and the child was born alive. This pelvis was generally contracted, and when the head had entered the pelvis ahead of the cord, a repeated prolapse was improbable. The child was a male. Weight six and a quarter pounds. Length 47 cm. The cord was 42 cm. long; insertion central; opening of membranes lateral. The length of the labor was ten hours and forty minutes.

CASE 39. Mrs. L. Para VI. Age 33. Disp. No. 5299. One former labor was a transverse presentation, the others were normal. *Diagnosis:* Occipito-læva-anterior. Date of labor, May 8, 1904. Pelvic measurements; IS, 25 cm.; IC, 28 cm.; BiTro., 30 cm.; Ext. Conj., 20 cm. The membranes ruptured spontaneously, after three hours of pains. Os dilated to admit three fingers. Fresh meconium in the liquor amnii. Prolapse of the cord and the right arm. The fetal pulse in the first stage was 160 and regular. Later in this stage, the heart tones increased in rapidity and became irregular. The uterine contractions were severe. One hour and forty-five minutes after the cervix was dilated, a podalic version was performed. A dead baby was delivered. It was a girl, weighed five pounds. Length 47 cm. The cord measured 76 cm.

CASE 40. Mrs. K. Para VIII. Age 38. Disp. No. 5506. Date of labor, August 14, 1904. *Diagnosis:* Scapula-læva-anterior. Pelvic measurements: IS, 27 cm.; IC, 30 cm.; BiTro., 31 cm.; Ext. Conj., 22 cm. The membranes had ruptured spontaneously in the first stage. The liquor amnii was clear. The fetal heart tones at first were 120, but later became very feeble and rapid. The cord had prolapsed outside of the vulva and pulsation was barely palpable. When I arrived, the os had dilated, and a version was done immediately, but the baby died during the extraction. The operation did not last over five minutes. The little girl weighed seven pounds, and was 50 cm. long. The condition of the child at the time of delivery offered only a desperate chance of saving its life.

CASE 41. Mrs. F. Para V. Age 31. Disp. No. 5625. Previous labors normal. Labor occurred October 6, 1904. *Diagnosis:* Occitito-læva-posterior. The fetal heart was not heard. Presenting part movable and not engaged. On internal examination in the second stage, the cord was found prolapsed about six inches from the cervix. The pulsation was weak. The membranes had ruptured spontaneously in the first stage, and the liquor amnii was stained with fresh meconium. The intern attempted to replace the cord with the hand, but being unsuccessful, he immediately performed a version. The baby, a boy, was delivered dead. The cord was 110 cm. long; insertion central; opening of the membranes central. This version was done by the intern without calling a member of the staff, which is against the rules of the Dispensary, but the condition of the child was critical at the time of the operation.

CASE 42. Mrs. F. Para IX. Age 35. Disp. No. 5829. No record as to former labors. Labor occurred December 27, 1905. *Diagnosis:* Scapula-læva-anterior. Pelvic measurements: IS, 26 cm.; IC, 31 cm.; BiTro.,

35 cm.; Ext. Conj., 22 cm. The membranes ruptured spontaneously in the first stage, and the liquor amnii was clear. The elbow prolapsed soon after and four hours later, the cord came down. When I arrived, the heart tones of the fetus were heard but faintly, and the cord was pulsating feebly. The uterine contractions were severe. The os being dilated, I performed a version. There was considerable difficulty in extracting the child, but a living baby was finally delivered. The babe was a girl, weighed ten and a half pounds, and was 51 cm. long. The cord was 87 cm. in length; eccentric insertion; opening of the membranes lateral. This was a favorable case, as the large pelvis, the presentation, and prolapse of the arm aided in preventing compression of the cord until the time of version. The fetus was only moderately asphyxiated.

Case 43. Mrs. P. Para I. Age 28. Disp. No. 6583. Labor occurred October 21, 1905. *Diagnosis:* Occipito-dextra-anterior. Pelvic measurements: IS, 24 cm.; IC, 26 cm.; BiTro., 30.5 cm.; Ext. Conj., 18.5 cm. In the first stage, the pains were weak, and from five to eight minutes apart. The fetal heart tones were regular, and 130 beats a minute. The membranes ruptured spontaneously with the escape of clear liquor amnii. The presenting part was not engaged. The cord prolapsed five inches from the cervix. Later in this stage, the fetal heart tones became irregular, and varied from 85 to 140. Three hours after the escape of the liquor amnii, manual dilatation of the cervix was followed by version, but the baby was delivered stillborn. The cord was 48 cm. long; insertion marginal; opening of membranes lateral. Here the fetus began to suffer as soon as the liquor amnii escaped. The pelvis was slightly justo-minor in character.

Case 44. Mrs. C. Para I. Age 23. Disp. No. 6606. Labor occurred October 29, 1905. *Diagnosis:* Occipito-dextra-anterior. Pelvic measurements: IS, 26 cm.; IC, 27 cm.; BiTro., 30 cm.; Ext. Conj., 19.5 cm. The presenting part was high and movable. Progress was slow. After the cervix was dilated, the pains became stronger and the membranes ruptured spontaneously, with fresh meconium in the liquor amnii. The cord was prolapsed four inches below the cervix. The fetal heart tones were now 90, and irregular. The patient was placed in the Trendelenburg position and the head held back by the hand. I arrived soon after and found the head movable, and lying in the transverse diameter of the inlet, which was flat and rachitic. As the cord was pulsating feebly, version was attemped, but the contraction ring was so firm that turning was dangerous if not impossible. The baby was delivered by the axis-traction forceps, but was dead. The cord was 76 cm. long; insertion central; opening in the membranes lateral. The delivery was postponed too late in this case. A high forcep operation in a rachitic pelvis offers little chance for a living child, still, as the cord was pulsating, it was thought best to give the child the benefit of the doubt.

Case 45. Mrs. K. Para III. Age 24. Disp. No. 6896. This patient has had two miscarriages. Labor occurred February 3, 1906. *Diagnosis:* Occipito-dextra-anterior. Pelvic measurements: IS, 26 cm.; IC, 27 cm.; BiTro., 31 cm.; Ext. Conj., 20 cm. In the first stage of labor, the pains were strong, occurring every ten minutes. The fetal heart tones were 146 and regular. The membranes ruptured spontaneously, and the cord was found prolapsed six inches below the cervix. The patient was placed in the Trendelenburg position, and an effort made to replace the cord, but without avail. Upon my arrival, I found the head movable in a mild, rachitic inlet. The partially dilated cervix was dilated by the Edgar-Bonnaire method, and an easy podalic version performed. The extraction was somewhat difficult, but a living baby was delivered. He weighed eight pounds and measured 50 cm. The cord was 59 cm. long and the insertion was central. The Trendelenburg position, and the forcing back of the head manually, were responsible for preserving the child until a version and extraction could be accomplished.

Case 46. Mrs. G. Para II. Age 27. Disp. No. 7433. Previous labors were normal. *Diagnosis:* Sacro-dextra-anterior. Labor occurred August 29, 1906. Pelvic measurements: IS, 25 cm.; IC, 29 cm.; BiTro., 32 cm.; Ext. Conj., 20 cm. The fetal heart tones were not heard in the first stage, which lasted thirty-three hours. The membranes had ruptured before the arrival of the attendants, and a pulseless cord prolapsed externally. The liquor amnii was stained with meconium. The mother was getting exhausted in the second stage, and I extracted the breech, doing a craniotomy on the after-coming head. The cord was 40 cm. long; insertion marginal; opening of the membranes nearly marginal. This baby was doubtless killed by pressure, before the membranes ruptured, as no heart tones could be heard for several hours previous to the escape of the waters. The placenta was implanted in the lower uterine segment.

Case 47. Mrs. B. Para VI. Age 26. Disp. No. 7473. Previous labors normal. Time of labor, August 13,1 906. *Diagnosis:* Occipito-læva-anterior. Pelvic measurements: IS, 22 cm.; IC, 24 cm.; BiTro., 28 cm.; Ext. Conj., 17 cm.; Circum., 82 cm. The interne was called in the second stage. The uterine contractions were severe, but the fetal heart was inaudible. The membranes had ruptured spontaneously and fresh meconium had been coming away for hours. The cord had prolapsed in front of the head and was pulseless. A spontaneous delivery was indicated and a dead, male infant, was soon born. He weighed eight and a third pounds, and was 52 cm. long. The cord was 60 cm. long; insertion eccentric. Labor lasted eleven hours and forty minutes. This was a flat, justo-minor pelvis, and the head required considerable moulding to pass through the birth canal.

Case 48. Mrs. G. Para VI. Age 30. Disp. No. 7596. Previous labors normal. Time of labor September 18, 1906. *Diagnosis:* Occipito-læva-posterior. During the first stage, the fetal heart was 160 and regular. The membranes ruptured spontaneously and fresh meconium was present. The cord prolapsed when the cervix admitted three fingers. The patient was chloroformed to the surgical degree, the cervix dilated manually and a version performed. The

SUMMARY OF FIFTY-THREE

Case.	Age.	Para.	History of Former Labors.	Condition of Child in First Stage of Labor.	Condition of Child in Second Stage of Labor.	Premature Rupture of the Membranes.	Condition of the Liquor Amnii.	Diagnosis.	Condition of Child at Birth.	Sex.
I	29	I	.....	.....	Poor.	No.	Meconium.	O. L. A.	Alive.	M.
II	33	V	Last instrumental.	Normal.	Poor.	Yes.	.....	O. D. P.	Dead.	M.
III	27	III	Two prolapses.	Normal.	Normal.	No.	Clear.	O. L. A.	Alive.	F.
IV	35	X	.....	.....	Poor.	No.	.....	.....	Alive.	F.
V	31	V	Normal.	Normal.	Poor.	No	Meconium.	O. L. A.	Alive.	F.
VI	20	I	.....	.....	Poor.	....	.....	Breech.	Dead.	F.
VII	30	III	.....	Normal.	Normal.	No.	.....	O. L. A.	Alive.	F.
VIII	38	VIII	.....	Normal.	Poor.	....	Clear.	M. L. A.	Alive.	M.
IX	27	III	First Labor — Forceps.	.....	Fair.	Yes.	Clear.	O. D. A.	Alive.	M.
X	40	XI	First child dead.	Normal.	Bad.	Yes.	.....	O. D. P.	Dead.	F.
XI	35	VIII	Normal.	Dead.	Dead.	No.	Meconium.	O. L. A.	Dead.	M.
XII	32	V	1 Prolapse. 1 Version.	Normal.	Poor.	No.	Clear.	O. L. A.	Died in 2 days.	M.
XIII	43	XII	Normal.	Normal.	Bad.	Yes.	Clear.	O. D. A.	Alive.	F.
XIV	30	VI	Hard, tedious.	Poor.	Poor.	No.	Meconium.	Sc. L. A.	Alive.	F.
XV	28	II	Last child dead.	Normal.	Poor.	No.	Meconium.	Post-parietal.	Alive.	M.
XVI	32	IV	.....	Fair.	Poor.	Yes.	Clear.	O. D. A.	Alive.	M.
XVII	38	X	Long, painful.	Normal.	Fair.	Yes	Meconium.	O. D. A.	Alive.	M.
XVIII	34	VI	Easy.	Weak.	Poor.	No.	.....	Sc. L. A.	Dead.	F.
XIX	24	IV	First operative.	Normal.	Poor.	No.	.....	Sc. D. A.	Alive.	M.
XX	25	III	.....	.....	Dead.	....	Meconium.	D. L. A.	Dead.	M.
XXI	31	VI	Normal.	Normal.	Poor.	No.	.....	Sc. D. P.	Dead.	M.
XXII	30	VII	Two still-births.	Poor.	Bad.	No.	Meconium.	O. D. A.	Dead.	M.
XXIII	35	VII	Normal.	Normal.	Fair.	....	.....	O. D. A.	Alive.	M.
XXIV	....	....	.....	.....	....	....	.....	Face.	Dead.	.
XXV	27	VIII	Normal.	Normal.	Bad.	No.	Meconium.	S. L. A.	Dead.	M.
XXVI	28	IV	First instrumental.	.....	Bad.	....	.....	Head.	Dead.	M.
XXVII	28	IV	Normal.	Normal.	.....	No.	.....	O. D. A.	Dead.	M.
XXVIII	30	III	Normal.	Bad.	Better.	Yes.	.....	O. L. A.	Alive.	F.
XXIX	36	VIII	Normal.	.....	Dead.	....	.....	O. L. A.	Dead.	F.
XXX	26	III	.....	Normal.	Dead.	No.	Clear.	O. D. A.	Dead.	F.
XXXI	32	XI	Normal.	Dead.	Dead.	No.	Meconium.	O. D. A.	Dead.	F.
XXXII	30	III	Normal.	.....	Poor.	....	.....	O. L. A.	Alive.	M.
XXXIII	32	III	Both operative.	Normal.	Normal.	No.	Clear.	O. L. T.	Dead.	F.
XXXIV	23	II	Normal.	Normal.	Normal.	....	.....	O. L. A.	Alive.	F.
XXXV	27	III	Normal.	Bad.	Bad.	Yes.	Meconium.	Sc. D. A.	Dead.	F.
XXXVI	33	VII	Normal.	Normal.	Bad.	No.	Clear.	O. L. A.	Alive.	F.
XXXVII	35	V	Normal.	.....	Normal.	No.	.....	O. D. P.	Alive.	F.
XXXVIII	21	II	.....	Normal.	Normal.	No.	.....	O. D. P.	Alive.	M.
XXXIX	33	VI	One cross-birth.	Normal.	Bad.	Yes.	Meconium.	O. L. A.	Dead.	F.
XL	38	VIII	.....	Normal.	Bad.	Yes	Clear.	Sc. L. A.	Dead.	F.
XLI	31	V	Normal.	.....	Weak	No.	Meconium.	O. L. P.	Dead.	M.
XLII	35	IX	.....	.....	Bad.	Yes.	Clear.	Sc. L. A.	Alive.	F.
XLIII	28	I	.....	Normal.	Bad.	Yes.	Clear.	O. D. A.	Dead.	F.
XLIV	23	I	.....	Bad.	Bad.	No.	Meconium.	O. D. A.	Dead.	F.
XLV	24	III	Normal.	Normal.	.....	Yes.	.....	O. D. A.	Alive.	M.
XLVI	27	II	Normal.	Dead.	Dead.	....	Meconium.	S. D. A.	Dead.	.
XLVII	26	VI	Normal.	.....	.....	Yes.	Meconium.	O. L. A.	Dead.	M.
XLVIII	30	VI	Normal.	Normal.	Normal.	Yes.	Clear.	O. L. P.	Alive.	F.
XLIX	28	II	Cross-birth.	Normal.	Normal.	Yes.	Clear.	O. L. A.	Alive.	F.
L	26	IV	Normal.	Normal.	Normal.	Yes.	Clear.	O. D. P.	Alive.	F.
LI	30	III	Normal.	Poor.	Poor.	Yes.	Meconium.	O. D. A.	Alive.	F.
LII	27	III	Normal.	Normal.	Normal.	No.	Clear.	Sc. D. P.	Alive.	F.
LIII	27	IV	One cross-birth.	Normal.	Normal.	No.	.....	O. D. A.	Alive.	F.

mother was allowed to come out partially from the anesthetic and then extraction was done. The baby girl was alive, weighed seven pounds, and was 46 cm. long. The cord was 95 cm. long; insertion central; opening of the membranes central. The early interference in this case, at the first sign of danger, was justified by the result obtained.

The three following cases were treated by the method of injecting normal salt-solution into the uterine cavity to take the place of the lost liquor amnii.

Case 49. Mrs. A. Para II. Age 28. Her former labor was a transverse presentation. Pelvic measurements: IS, 26 cm.; IC, 28 cm.; BiTro., 30 cm.; Ext. Conj., 18 cm.; Circum., 90 cm.; CV, 10.5 cm.; CD, 12 cm.; BiIsch., 11 cm. Labor occurred June 1, 1906. During the first stage, the fore-lying cord was palpated in front of the head. The head was movable above the inlet

CASES OF PROLAPSUS FUNIS.

Weight pounds.	Maturé.	Length	Length of Cord.	Insertion.	Opening of Membranes	Pelvic Deformity.	Complications.	Treatment.
6.5	Yes.	..	58	Eccentric.	Lateral.	....	.....	Forceps.
8.8	Yes.	50	56	Central.	.....	Flat.	.....	Reposition. Version.
8	Yes.	52	60	Eccentric.	Lateral.	Normal.	Hydramnion.	Version.
8	Yes.	..	50	.....	.....	Justo-minor.	.....	Version.
7	No.	47	72	Marginal.	.....	Flat.	.....	Normal labor.
7.75	Yes.	52	70	Marginal.	Lateral.	.....	Prolapsefoot.	Tren. position. Extraction.
7.5	Yes.	50	52	Eccentric.	Lateral.	Normal.	.....	Version.
6	Yes.	54	51	Lateral.	Lateral.	Normal.	.....	Normal labor.
9.25	Yes.	..	112	.....	Lateral.	.....	Hydramnion.	Forceps.
7	Yes.	54	70	Eccentric.	Lateral.	Normal.	.....	Braxton-Hick's Version.
8	Yes.	52	72	Eccentric.	Lateral.	Justo-minor.	.....	Normal labor.
9	Yes.	50	48	Eccentric.	Lateral.	Normal.	.....	Tren. position. Version.
6	No.	45	53	.....	Marginal.	Justo-minor.	Placenta prævia.	Normal labor.
6	No.	48	40	Eccentric.	Lateral.	Flat.	Prolapse of hand.	Version.
7	No.	48	53	Lateral.	.....	Flat.	Post. Par. Bone Pres.	Tren. position. Version.
7.5	Yes.	50	66	Eccentric.	Lateral.	Normal.	Prolapse arm.	Forceps.
8.5	Yes.	51	72	Central.	Median.	Normal.	.....	Tren. position. Version.
8	Yes.	50	58	Eccentric.	Marginal.	Normal.	Placenta prævia.	Version.
9	No.	42	85	Eccentric.	Lateral.	Flat.	Cross-birth.	Version.
8.5	Yes.	58	86	Central.	Lateral.	....	.....	Normal labor.
Large	Yes.	..	..	.....	.....	Normal.	Hydramnion.	Embryotomy.
10	Yes.	57	74	Central.	Central.	Flat.	Ant. par. bone pres.	Embryotomy.
8.5	Yes.	49	Long	Lateral.	Lateral.	Justo-minor.	Hydramnion.	Knee-chest. Reposition. Forceps.
....	....	..	....	.....	.....	.....	Face pres.	Craniotomy.
8	Yes.	54	60	Eccentric.	.....	Normal.	Breech.	Extraction.
6	No.	48	91	Central.	Central.	Normal.	.....	Tren. position. Normal labor.
10	Yes.	50	84	Central.	.....	Normal.	Hydramnion.	Tren. position. Version.
5.25	No.	48	55	Eccentric.	.....	Normal.	Prolapse foot.	Version.
10	Yes.	57	140	Central.	Lateral.	.....	.....	Normal labor.
9.25	Yes.	51	68	Eccentric.	Central.	Normal.	.....	Craniotomy.
10.5	Yes.	55	50	Central.	Central.	Justo-major.	.....	Normal labor.
6.75	No.	40	68	Central.	Lateral.	Justo-major.	.....	Knee-chest position. Reposition.
9.75	Yes.	52	50	Central.	Central.	Flat.	Pelvic deformity.	Version. Craniotomy.
8	Yes.	48	61	Central.	Lateral.	Flat.	Pelvic deformity.	Knee-chest position. Version.
6	Yes.	51	50	Lateral.	Lateral.	Normal.	Cross-birth.	Version.
8	Yes.	50	95	Eccentric.	Lateral.	.....	.....	Version.
9	No.	48	66	Central.	Lateral.	.....	Prolapse hand.	Tren. position. Version.
6.25	No.	47	42	Central.	Lateral.	Justo-minor.	Pelvic deformity.	Knee-chest pos. Normal labor.
5	No.	47	76	.....	.....	Normal.	Prolapse arm.	Version.
7	Yes.	50	..	.....	.....	Justo-major.	Cross-birth.	Version.
7	Yes.	52	110	Central.	Central.	Normal.	.....	Manual Reposition. Version.
10.5	Yes.	54	87	Eccentric.	Lateral.	Normal.	Prolapse elbow.	Version.
6.25	Yes.	40	48	Marginal.	Lateral.	Justo-minor.	.....	Manual Dilatation. Version.
7.5	Yes.	51	76	Central.	Lateral.	Rachitic.	.....	Tren. position. High forceps.
8	Yes.	50	59	Central.	.....	Rachitic.	.....	Tren. position. Version.
....	....	..	40	Marginal.	Marginal.	Normal.	Breech	Extraction. Craniotomy.
8.33	Yes.	52	60	Eccentric.	.....	Flat. Justo-minor.	.....	Normal labor.
7	No.	46	95	Central.	Central.	.....	.....	Manual Dilatation. Version.
8	Yes.	52	69	Central.	Lateral.	Flat.	.....	Version.
8	No.	47	84	Lateral.	Lateral.	Normal.	.....	Version.
8	Yes.	52	68	Eccentric.	Lateral.	Flat.	.....	Version.
9	Yes.	52	65	Central.	Lateral.	Normal.	5 Cross-birth.	Version.
8	No.	48	60	Marginal.	Lateral.	Justo-minor.	7 Prolapse of hand Prolapse of both hands.	Version.

and the diagnosis was occipito-læva-anterior. As the cord came down on the right and anterior portion of the pelvis, the patient was placed on the left side, with several pillows beneath her hips. A Karl Braun metreurynter was placed next to the cervix, and filled nearly full of a weak lysol solution. These measures were taken to prevent the premature rupture of the membranes. The pains were quite severe and the patient was very nervous. The fetal heart beat 130 times a minute, and was regular. The heart tones were auscultated every half hour. During one of the severe pains, the membranes ruptured and the bag was expelled. The cord had prolapsed some four inches below the cervix and was pulsating strongly. The head was still mobile. Nearly a pint of clear liquor amnii escaped as the patient rolled off the pillows. She was immediately placed in the Trendelenburg position, using the inverted kitchen chair as a support. The bag was then sterilized, while a little chloroform was given to overcome the expulsive pains. Before the introduction of

the apparatus, the head was forced upward, and I was able to get the lowest loop of the cord nearly four inches above the external os. The bag was now inserted through the cervix, which at this time admitted three fingers. After filling, about a pint of the normal salt-solution was slowly injected into the uterine cavity. But little force was used. The fetal heart, at the time of the rupture, had increased to 150 beats a minute, and was still regular, though not so vigorous. The introduction of the salt-solution took nearly five minutes and as some of it leaked out, nearly a pint and a half was used altogether. The fetal heart soon after was beating 134 times a minute and the patient was allowed to come out from under the influence of the anesthetic. The pains soon became strong but the patient was not allowed to bear down. As the salt-solution leaked out, more of the lysol solution was forced into the bag to compensate for the increasing dilatation of the cervix. The bag remained in the cervix for two hours and fifteen minutes. At this time the cervix was practically dilated, and a version and extraction was performed. The lowest loop of the cord was found just above the child's chin. A living child was delivered. There was slight asphyxia. After the delivery of the child, a moderate amount of the salt solution escaped. The baby was a girl, weighed eight pounds and was 52 cm. long. The cord measured 69 cm.; insertion central; opening of the membranes lateral.

Case 50. Mrs. O. Para IV. Age 26. Former labors normal. Labor occurred July 19, 1906. *Diagnosis:* Occipito-dextra-posterior. Pelvic measurements: IS, 26 cm.; IC, 29 cm.; BiTro., 30 cm.; Ext. Conj., 18 cm.; Circum., 92 cm.; CD, 12.5 cm.; CV, 10 cm.; BiIsch., 10 cm. The head was high and movable. The baby was slightly premature, about eight and a half months. During the first internal examination, the cervix was found to be effaced and the os dilated to admit two fingers. The membranes appeared very soft and thin to the palpating finger, and this condition was found postpartum. Some question arose as to whether the pulsation, palpable at the os uteri, was due to a velamentous insertion or a fore-lying cord and in endeavoring to examine further, the membranes ruptured and a loop of the cord came down into the vagina. The liquor amnii was clear and a little over a pint was lost. The fetal heart tones before the rupture were 150 and regular, but were poorly transmitted because of the thickness of the abdominal walls. The patient was placed immediately in the Trendelenburg position on the bed, and the head pushed out of the inlet. The cord was pushed back into the cervix and as far up as possible. The pains were weak. Anesthesia was not necessary. The bag was introduced above the internal os uteri, and nearly a pint and a half of saline solution injected. It was necessary to introduce the fluid slowly, as otherwise the uterine contraction would interfere. Shortly after the apparatus was in place, the pains became strong and lasted from three to five minutes, and I concluded that I had forced in too much fluid. I then released about ten ounces and the character of the pains immediately changed. About eight ounces of the solution leaked out, but this was replaced by further injection. The fetal heart varied from 140 to 160 beats per minute, but was regular throughout the entire period of labor. The pains resembled those of normal first stage labor pains, and were fairly severe in intensity. In three hours and five minutes, the salt-solution escaped freely, and the bag was on the point of being expelled. As preparations for version had been in readiness, chloroform was administered, and the internal hand came in contact with the cord, at the level of the ear, and in a position where it would otherwise be subjected to pressure, had there been no fluid in the uterine cavity. A version was done and a living child extracted. It was not asphyxiated. The cord measured 84 cm.; insertion lateral; opening of membranes lateral. The rent was six inches from the placental margin. The interesting points in this case were the effect of the varying amounts of fluid in the uterine cavity on the character of the pains. Another point was the location of a loop of the cord alongside the head, and yet not pressed upon, because of the presence of the salt-solution.

Case 51. Mrs. S. Para III. Age 30. Previous labors normal. Pelvic measurements: IS, 26 cm.; IC, 28 cm.; BiTro., 30 cm.; Ext. Conj., 18 cm.; Circum., 90 cm.; CD, 12.5 cm.; CV, 10.5 cm.; BiIsch., 11 cm. *Diagnosis:* Occipito-dextra-anterior. Labor occurred August 30, 1906. I was called to this case because of a prolapse of the cord in the first stage of labor. The cervix was effaced and the os uteri admitted three fingers. The heart tones numbered 100 and were irregular. There was some old meconium in the liquor amnii. The head was movable above the pelvic inlet. The pains were weak and occurred every five to ten minutes. The cord had prolapsed about five inches and was pulsating. The patient was placed in the Trendelenburg position and the cord was pushed back of the presenting part. The bag was then introduced into the cervix and a pint of solution was injected. The quality of the fetal pulse did not improve. After waiting half an hour, the pulse dropped down to 90 and was still irregular. There was considerable leakage. The pains were weak and the progress of labor slow. The bag was now removed and examination showed the cord to lie between the head and uterine wall. The head was then pushed over into the right iliac fossa, and a scapula-dextra-anterior position secured. The character of the fetal pulse improved greatly after this, and within fifteen minutes was beating 130 times a minute. The bag was re-introduced, and the salt solution passed in again. On account of the leakage, pieces of wet cotton were packed around the tubing in the vagina. From this time until the cervix was dilated, about four hours, the pulse varied from 130 and 140, and was fairly regular. When the bag was expelled, I turned and extracted a living baby. It was asphyxiated and required twenty minutes to revive it. The cord was 68 cm. long; insertion eccentric; opening of the membranes lateral. It is my belief that the failure of the bag to work in the first instance was due to a deep laceration of the right side of the cervix that served as an exit for the salt solution. The same difficulty was experienced after the cross birth was substi-

tuted, but the cord was in less danger from compression. Nearly three quarts of salt solution were injected into the uterus in this case to make up for the loss by leakage.

Since writing the above article, two other cases have been treated in the Dispensary service as follows:

CASE 52. Mrs. F. Para III. Age 27. Previous labors normal. Pelvic measurements: IS, 26 cm.; IC, 28 cm.; BiTro., 30 cm.; Ext. Conj., 19 cm.; Circum., 88 cm.; CV, 10 cm.; BiIsch., 10.5 cm. At the time of the arrival of the intern, the pains were severe and frequent. The heart tones were 140 and regular. Small parts were felt on both sides of the median line of the abdomen. The cervix was dilated to admit five fingers, and the fore-lying cord was felt in the intact membranes. The presenting part was high above the inlet. An enema was given to empty the rectum and sigmoid, and while this was operating the membranes ruptured. The cord prolapsed about four inches and was pulsating strongly. Posture was not used in this case by the intern. When I arrived, one and a half hours after the liquor amnii escaped, the fetus lay in the scapula-dextra-posterior position, the right hand had prolapsed, and the cord had fallen down between the symphysis pubis and the fetal abdomen. During the examination, the pulsations suddenly ceased, and I immediately turned and extracted a living baby. There was no asphyxia. The head passed through the pelvis in the transverse diameter. The placenta was located on the left and posterior wall of the uterus, about six inches from the margin of the rent in the membranes. The baby, a girl, weighed nine pounds and was 52 cm. long. The cord was 65 cm. in length; insertion central. The utero-vaginal tract was tamponed for a moderate postpartum hemorrhage.

CASE 53. Mrs. P. Para IV. Age 27. Conf. No. 8046. There is a history of one transverse presentation, where the child was delivered by version and extraction. The other labors were normal. Labor occurred March 2, 1907. *Diagnosis*, Occipito-dextra-anterior. Pelvic measurements: IS, 24 cm.; IC, 28 cm.; BiTro., 33 cm.; Ext. Conj., 19 cm.; Circum., 97 cm. The fetal heart was 148, and regular in the first stage. The uterine contractions were weak. An internal examination made by the intern in the second stage, to determine the cause of delay, showed the cord and both hands prolapsed below the head. The cord was pulsating normally. The head was movable and not engaged. No treatment was employed pending my arrival, as the presence of both arms was considered good protection against pressure. Frequent auscultation of the fetal heart was made. I found the conditions practically unchanged at the time of my arrival at the house, and immediately performed a podalic version. The child was alive and in two minutes was crying vigorously. There was some difficulty in pushing the head up out of the lower uterine segment, but not of such an extent as to warrant the double manual or Broesa's method. The little girl weighed eight pounds, was 48 cm. long, and was at full term. The cord was 66 cm. long, and the insertion was marginal. The rent in the membranes measured five inches from the placental edge. The time of rupture of the membranes could not be ascertained, nor the condition of the liquor amnii. There was no liquor amnii remaining in the uterine cavity when the version was performed.

This case was a favorable one, the pelvis was of good size and no difficulty was experienced in the extraction. The presence of both arms alongside the head, and the cord lying between them, served as as an ideal guard even when the amniotic fluid had entirely escaped. To this natural safeguard, owing to the late diagnosis, must be credited the successful outcome of the case. The mother had a chill and sudden rise of temperature to 104° F. on the third day, but this was relieved by a brisk cathartic, and the administration of ergot and hydrastis.

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THE INDUCTION OF LABOR AT TERM

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I ATTEMPTED to prepare a statistical paper, and present some results of pathologic examinations in these cases. However, an enormous press of work in the last four months has absolutely prevented that, and therefore I am going to present to you the opinions and deductions which I have drawn from this experience, and these pathologic findings, for your consideration.

There are many established and approved indications for the induction of labor before term. Such are: contracted pelvis, eclampsia, placenta previa, habitual death of the fetus after viability but before term, etc. The induction of labor at full term, or a few weeks before it, is also a recognized procedure in cases where the patient gives a history of abnormally large children, and one might have to induce labor at term for any indication that threatens either mother or child.

This paper will deal with an indication for inducing labor at term that is not so generally accepted, but, in the opinion of the writer, is a real one and if more broadly recognized would save many lives and much suffering. The writer would recommend that pregnancy be not allowed to proceed much longer than the usually allotted period of 280 days, but that, when gestation is completed, and the patient goes overtime, labor should be brought on. The patient should not be allowed to go too far overtime.

Is there such a condition as carrying overtime? A few authors deny it. The majority believes that cases of prolonged pregnancy occur. Various statistics give the period of pregnancy as extending from 259 to 330 days. Cases are recorded where pregnancy is said to have lasted 341, and 409 days, but, aside from the reasonable doubt as to their authenticity such anomalies do not concern us here. The vast majority of pregnancies terminates at about the end of ten lunar months, or 280 days, from the first day of the last menstruation. It may then be assumed that the period of human gestation requires 265 to 275 days, and that, given such a length of time, the fetus is fully developed and viable. If a woman continues in her pregnancy beyond the time stated, she may be said to be carrying overtime, though this, unless very long, may not always be pathologic.

That accoucheur who watches his cases of pregnancy thoughtfully, and who individualizes his patients scientifically, will find that there are many disadvantages, not a few pathologic conditions, and occasional deaths as the result of allowing pregnancy to go beyond its usual length. Not infrequently labor starts, as evidenced by uterine action and the show, or even the rupture, of the membranes, and some dilatation of the cervix; and, for some reason, the pains cease, and the woman continues in pregnancy for one, two, or even four weeks. Sometimes the pains recur at intervals and they may prevent sleep. This prolonged labor may make inroads on the mother's health. I have seen such cases of prolonged labor, with more or less regularly recurring painful uterine contractions, and two or even four fingers dilation.

Recently a woman was admitted to the Mercy Hospital from South Dakota, who had been in labor (premature) for six weeks. The uterus was contracted. Regularly, at intervals of from three to five minutes, the uterus, as a uterus in labor, would contract. The contractions were painful. The mouth of the uterus had dilated to the size of a ten-cent piece, and easily admitted the index finger. The loss of sleep during these six weeks, and the constant pains, had made such inroads on the woman's health that she was admitted to the hospital in almost a typhoid condition. She was subicteric, with thin facies and extreme emaciation. Her condition was critical. She had sordes on the teeth, a dry, red tongue, and looked for all the world like a typhoid patient. There was no fever.

The dangers in such cases are not all theoretical. The patulous os invites infection, especially in those patients who practice coitus

throughout pregnancy. It has been definitely proven that bacteria may wander through the intact membranes. It is more than possible that certain cases of infection, intra- and post-partum, and certain infections of the new-born, are contracted through the open cervix of late pregnancy. The uterus and vagina, in some cases, form one continuous passage. If the bag of waters should rupture this danger of infection becomes a reality.

The writer has had one case of a child having been born from an apparently healthy mother who developed, within a few hours after birth, a temperature of 101°, and died within four or five days with acute streptococcus infection, while the mother remained free.

One child delivered by the author had a nasal discharge as soon as it was born which, on examination, showed the diplococcus pneumoniæ.

In women of nervous temperament, this prolongation of the gestation is very disturbing. The loss of sleep and anxiety have a bad effect on their *morale*, so that when labor finally does set in, half their courage is gone, and weakness of the powers of labor is frequently noted. Forceps delivery and post-partum hemorrhage are common for this reason and from another cause soon to be mentioned. In a recent paper, Reynolds (SURGERY, GYNECOLOGY AND OBSTETRICS, March, 1907) describes cases of neurasthenic women in which he believed the elective Cæsarean section at term offered better chances for mother and babe than natural or operative-delivery from below.

This is mentioned simply as an index of the trend of modern obstetrics, and is the opposite of the supine expectancy that most practitioners have with regard to their obstetric cases. It behooves every practitioner to make a careful study of each individual case with a view of preventing all possible accidents and complications at the full term of pregnancy. Death of the child is not infrequent from carrying it too long in the uterus. The writer is aware that this is a bold statement, and also that he cannot prove it scientifically, as there are so many other conditions that have to be taken into consideration in determining the cause of death. Several women have presented themselves with the voluntary statement that their babies die at or near term, or when they are overterm. One woman lost two children without apparent cause, except carrying overtime, and came to the writer with a direct request for the induction of labor before the end of gestation. The operation was performed and a living child procured. The older writers used to speak of habitual death of the child after viability but before term, and allowed it as an indication for the induction of labor. Syphilis, endometritis, and Bright's disease cause most of these cases of death, and in the presence of such conditions the treatment is plain.

A certain proportion of the deaths, without doubt, in the mind of the writer, is due to over-ripening of the ovum. In one such case that occurred in the writer's practice, Professor Zeit, from a careful macroscopic and microscopic postmortem, could find nothing to explain the death, save signs of epithelial degeneration in the kidneys. The chief nurse at the Chicago Lying-in Hospital, a woman of much experience and good judgment, very recently called my attention to the coincidence of still-births, and asphyxiated children, in the waiting women who led lazy lives about the hospital. She had noted that in them labor was delayed and often prolonged, and that an unusual proportion of their babies were still-born, or came asphyxiated, or covered with meconium, or even with the placenta detached at the moment of delivery. These children were not of unusual weight, but had hard heads. In some rare cases labor is "missed" entirely, the fetus dies, and is expelled months later, or removed by the accoucheur. The death of the child is similar to that of the child in extra-uterine pregnancy at term. The cases above referred to are similar in some respects, then, to "missed labor." Perhaps the thrombosis that occurs at the placental site becomes too extensive to permit fetal metabolism.

A slight pelvic contraction, especially in a case of funnel-shaped pelvis, will give an indication for the induction of labor at term. As to the induction of labor for contracted pelvis, while perhaps it should not be considered in this paper, still when we consider the frequency of slight degrees of pelvic contraction, I wish to emphasize the funnel-shaped pelvis. I think more attention should be paid to it.

In these cases, where the bony outlet is found to be narrower than normal, the necessity of inducing labor at full term should be considered. I have noticed a slight degree of funnel pelvis in women who have suffered from dysmenorrhea and who have evidences of infantile cervix. An authentic history of several over-grown children, of course, would indicate interference.

In many, but not all, cases of prolonged pregnancy, the child is over-grown. Statistics prove what individual experience has long noticed, the children, if not actually larger, are of different consistence. The head is harder and the biparietal diameter is greater. The broadness of the head, the prominence of the parietal bosses, and the greater ossification of the bones, are striking. They increase the difficulty of labor and complicate the mechanism more than simple increase in size of the child. The body is longer, also, and the spinal column is less flexible. In some cases there is an increase of weight, due to the hardening of the tissues, and sometimes the child has overgrown in every way, both in size and weight. As a result of these conditions, I have noted the following anomalies in labor to be more frequent:

1. Lack of cephalic moulding, high arrest of head, prolonged and fruitless labor, forceps, hard extraction, extensive injuries.

2. Occipito-posterior positions, absent rotation, forceps, etc.

3. Deflexion attitudes, military attitude, forehead, brow, and even face presentations and their sequellæ.

4. More or less disproportion between the size of the passage and the passenger, prolonged labor, and operative interference.

Many irregularities in the labor, apart from those of mechanical disproportion, and anomalies of mechanism have been observed. Some of these are indirectly caused by, or indirectly influence, the mechanical factors in labor. The pains are apt to be irregular, intermittent, and ineffectual. On the other hand, occasionally, they are tumultuous and quickly deliver the child, perhaps precipitately, injuring it or the mother. The writer had one case of complete rupture of the uterus, where the pregnancy was prolonged by a prolonged labor. This is the exception. Weak pains are the rule. It is possible that a fatty degeneration of the uterine muscle occurs in these weeks of prolonged pregnancy (Bossi). This invites traumatic rupture or produces inertia. This muscular weakness often necessitates the use of forceps. The lack of strong uterine contrac tions leaves the cervix and vagina without the softening and succulence necessary for safe dilatation, wherefore lacerations of the parts are frequent, and all operative intervention rendered laborious. The same inertia is carried over into the third stage, and postpartum hemorrhage caps the climax to a succession of complications.

The writer wishes it understood that these are not constant accompaniments of labor after prolonged pregnancy, but that they are more frequent than in normal cases, and that they justify interference in many cases. It is his practice, therefore, to watch the pregnant women carefully, as they near the computed time for delivery, and when this has arrived, and is passing, to consider the advisability of inducing labor.

If one practices among intelligent women it is always possible to obtain the dates of menstruation, of quickening, and lightening. Nearly always it is possible to learn the date of the fruitful coitus. By computing in the usual manner, one decides on the probable date of labor. When the day arrives, unless labor has begun sooner, the patient is very carefully examined. The parts are prepared as aseptically as for labor, because the finger is to be inserted into the uterus. Shaving and antiseptic washing of the genitals are practical, and the lower vagina is washed out with lysol solution. The child is measured by hand and Perret's cephalometer, and its probable viability and size determined. The fetal heart is auscultated. The fetus is minutely palpated from all sides, its position determined, and its weight estimated.

With practice one learns to guess within a half pound of the infant's weight. An error of a pound is not common, and when it occurs it is usually in favor of the child; that is, one guesses below its actual weight. The use of cephalometry is not as general as it should be. Practically useful information may nearly

always be obtained with the Perret instrument. Next an internal examination is made. Sterile gloves are always used, and the parts are prepared as if for operation. One determines first if the head has entered the pelvis; that is, if lightening has occurred. The symptoms of lightening are sometimes simulated by a relaxation of the abdominal walls in the later weeks of pregnancy. The softening and patulousness of the cervix are next investigated. If the cervix is very soft, the os open for one or even two fingers, especially if some effacement has taken place, one may feel sure that labor is near at hand. Often the os is so soft and open that one feels as if a few pains would deliver the child. This is found in multiparæ.

These cases, then, are considered at term and ready for delivery. I usually instruct the patient, if labor does not come on within a week, that I will set a date and induce labor. The diagnosis of the viability of the child is made, first, on the data which the patient furnishes, which gives the time at which to make the internal examination; second, upon the evidences of labor being inaugurated very shortly; and, third, upon the abdominal and internal findings as far as the child is concerned. The nearness of labor may also be determined by the sensitivenes of the uterus. If with slight manipulation the uterus contracts readily, labor is not far distant. The history of false or true pains will also aid in determining that labor is not far distant. If a woman says that every night she has false pains, it is a good sign that labor is about to begin, and it requires very little stimulation to bring it on. Cases are on record where labor pains had been present for six or eight weeks; an internal examination will guard against error in such patients.

The methods required at term are simple, because the uterus is already at the point of contracting, and it requires very little stimulation to set it in actual work. I have a method which is not original with me, but which is very efficient and safe. I use an old-fashioned tubular packer that is on the market; I have had it curved instead of straight, to correspond with the perineal curve, and thus to relieve the woman of pain. I have prepared a special gauze which is made up in smooth strips five yards long; it is a woven bandage. It is an ideal gauze for the purpose and is kept in sterile jars. I use the ordinary tubular packer, which is put in the cervix, and by gently rotating the instrument one can pack all around the lower uterine segment. The presence of the gauze stimulates the uterus to contract. The operation is so simple that it can be done without an anesthetic, when the woman is at term, and it may be used instead of, or along with, other recognized methods of inducing labor.

I appreciate the danger of recommending a procedure of this kind to the general practitioner. The field of error is not small. Arguments can be advanced to show that the length of pregnancy varies a good many days, and that a mistake of three or four weeks can be made, and the child delivered before it is really capable of carrying on an effective fight against the elements after its delivery. However, in the vast majority of cases, pregnancy lasts from 275 to 280 days, and we can come within two weeks either way. A mistake of two weeks would not make much difference if the baby came too soon, and if the woman should carry her baby two weeks longer, it would be safe anyway.

The nearer the woman is to spontaneous labor the easier it is to induce labor pains, but it must be admitted that occasionally the simple means fail, and one has to resort to powerful measures to set the uterus in operation. In a properly equipped maternity one may use these measures safely, and if the uterus reacts poorly to stimulation, it is not unreasonable to conclude that in such a case pregnancy would probably have been prolonged far beyond the safe period for mother and child.

TRANSACTIONS OF SOCIETIES

TRANSACTIONS OF THE AMERICAN SURGICAL ASSOCIATION

MEETING HELD AT WASHINGTON, D. C., JUNE 7; 1907

DR. DUDLEY P. ALLEN

CLEVELAND, OHIO

The President of the American Surgical Association, Dr. Dudley P. Allen, took as the title of his Address, "The Teaching of Surgery." (See paper, *ante*, p. 1.)

PROFESSOR E. KÜSTER

MARBURG, GERMANY

Professor E. Küster read a paper entitled "Spinal Anesthesia." He dealt particularly with the drug known as novocain, as a spinal anesthetic. He presents his conclusions based on about 300 cases of spinal anesthesia induced by this drug. His results have not only been most satisfactory but most convincing to him, that in operations upon the lower extremities, and in fact in operations up as high as the umbilicus, spinal anesthesia is justifiable. He also believes it very suitable for examinations, and for the introduction of instruments. Although he has frequently gone above the line of the umbilicus, when using novocain, he finds that it sometimes is necessary to induce general narcosis.

It has been Küster's experience that patients during operations under this method feel absolutely no pain, and suffer almost no after effects. There is, however, generally, a feeling of sickness and desire to vomit. But, on the average, at the end of an hour and a half, the action of the anesthetic will be over, and the patient will begin to experience genuine sensations of pain.

Some patients, who during the anesthetic experience motor paralysis, later assert that they still feel a sensation of weakness in their legs which does not prevent their walking, but makes them limp a little. In a few hours this is completely overcome. It is noteworthy that sensation more quickly returns than does motion.

The principal ill effect following lumbar anesthesia by novocain is headache, which appeared in 14 per cent of Küster's first 200 cases. He states, however, that this can be readily relieved by puncture of the dural cavity, and the withdrawal of about 10 c.c. of fluid.

The author has only once seen pneumonia follow this anesthetic, and it is noticeable that in this case a general narcosis was finally necessary. He therefore believes the fact that pneumonia seldom or never follows spinal anesthesia, is one of the most powerful arguments in favor of its employment.

DR. ROBERT W. JOHNSON

BALTIMORE

Dr. Robert W. Johnson, presented a unique paper entitled, "Resection of the Sound Femur in Gigantism and Asymmetry." (See paper, *ante*, p. 62.

DR. OSCAR H. ALLIS

PHILADELPHIA

Dr. Oscar H. Allis presented a contribution on "Guarded Vertical Traction in its Application to the Reduction of Congenital Dislocations." (See paper, *ante*, p. 76.)

DR. J. COLLINS WARREN

BOSTON

Dr. J. Collins Warren presented a paper compiled by Doctors R. B. Greenough, C. C. Simmons, and J. D. Barney of Boston upon "The End-Results in Operations upon Carcinoma of the Breast. (See paper, *ante*, p. 39.)

DR. FREDERIC S. DENNIS

NEW YORK

Dr. Frederic S. Dennis presented a contribution to the symposium on "The End-Results following Cancer of the Breast." (See paper, *ante*, p. 57.)

DR. WILLY MEYER

NEW YORK

Dr. Willy Meyer in his contribution to the symposium on "End-Reuslts Following Operations for Carcinoma of the Breast," presented his personal statistics, covering 84 cases (86 operations) with carcinoma of the breast, operated upon by his radical method (*New York Medical Record*, December 15, 1894; *Journal American Medical Association*, July 29, 1905), between September 1894, and April 1907. (See paper, *ante*, p. 54.)

Dr. Lewis S. Pilcher

Brooklyn

Dr. Lewis S. Pilcher presented a contribution to the symposium on "End-Results Following Operations for Carcinoma of the Breast."

His paper dealt particularly with 18 cases in which the evident extension of the disease at the time they first presented themselves, was great enough to arouse suspicion of possible infection of the lymph-nodes above the clavicle. In 4 cases glandular masses in the neck were distinctly palpable; of the 14 in which the examining finger could not appreciate the presence of diseased nodes in the neck, section revealed infected nodes present in 11; and in only 3 cases appreciable disease was not recognizable upon section. Of these last mentioned, 3 cases all have remained well from the time of operation, a period of 5, 1½, and 1 year, respectively.

Of the four cases in which the supraclavicular glands were palpable before operation, 1 case died 3 months after operation, evidently from internal metastasis. The second case had 2 periods of recurrence and died 5 years after the primary operation. The third case died 2 years after operation, it is thought from a carcinomatous element in the pulmonary condition, she having been said to have died from pneumonia. The fourth is now, 2 years after operation, perfectly well without any evidence of recurrence.

In each of the foregoing cases the supraclavicular spaces were cleared out, and the typical operation performed upon the thorax and axilla.

Of the remaining 11 cases 1 died from myocarditis, 7 weeks after operation; 3 developed speedily, both regional and distant metastases, all dying within a year; a fourth was reoperated upon for a recurrent nodule in the lateral thoracic region, a year after the primary operation; she died 3 years after primary operation from carcinoma of the liver. A fifth case remained well for 5 years, but has now developed both supraclavicular and thoracic recurrences. Four cases remained free from recurrence after periods of 3, 3, 2, and 1 year, respectively.

Dr. A. J. Ochsner

Chicago

Dr. A. J. Ochsner contributed a paper on the "Final Results in 164 Cases of Carcinoma of the Breast Operated during the past Fourteen Years at the Augustana Hospital, Chicago."

Of these cases 101 have been traced to the present time. Fifty-seven of these cases are still living, all but 2 without recurrence. Thirty-nine of these cases have lived more than 3 years; 25 cases more than 5 years; 5 cases more than 10 years; 5 cases died from shock; 20 cases died within 1 year; 6 cases within 2 years; 6 within 3 years; 1 within 4 years; 2 within 5 years, and 1 case each 6, 7, 11, and 14 years after the primary operation. Five cases died free from recurrence. Two of these lived for 3 years, and 1 each for 7, 9, and 10 years.

During the past 6 years all patients have received post-operative X-ray treatment while in the hospital, and 22 cases continued this treatment after returning to their homes. Several cases were apparently benefited by this treatment.

Dr. Nathan Jacobson

Syracuse, New York

Dr. Nathan Jacobson read a paper entitled "End-Results Following Operations for Carcinoma of the Breast," this being a contribution to the symposium on this subject. The following is a short abstract of his paper:

The rapidity with which carcinomatous disease of the breast manifests itself is of the greatest importance. Scirrhous cancer can present as acute manifestations as those of the medullary type. One case referred to, in which death followed spinal metastasis within 6 months after the first evidence of the disease, confirms this statement. These acute forms of carcinoma, whatever their pathologic character may be, are not amenable to permanent relief by operation, recurrence, either local or general, appearing in a short period despite any form of surgical operation.

A second group of cases is one in which marked susceptibility to carcinomatous invasion is evident by repeated outbreaks of the disease in various parts of the body, without recurrence at the site of primary disease. Several cases of this type are referred to, 2 in which the first manifestation was in the uterus, the breast being involved at the end of 2 or 3 years subsequently. One of these patients died of recurrences which appeared rapidly for 8 years; the other died within 5 years of cancer of the stomach. In this class of patients individual susceptibility to cancer cannot be overlooked.

Advanced age is not a contraindication to operation, this statement being confirmed by the history of 2 cases, one operated upon at 80 years of age without recurrence, the second at 78 with no recurrence, the woman living 5 years after operation, and dying of vascular disease of the brain.

Reference is made to a paper by the author presented to the Medical Society of the State of New York, in 1896, in which the statistics of a so-called cancer-cure institution were presented. Fifteen cases of cancer of the breast treated, in that institution by cancer pastes, were followed to their end-

result, and in each instance death followed from cancer.

The possibility of permanent cure, following secondary operations for cancerous recurrence, was emphasized.

The writer refers to his method of operative procedure, in which during the past 10 years he has followed the technique of Dr. Halstead, except as to the removal of the supraclavicular glands. In the decade preceding the last 10 years his method was that suggested by the late Dr. Samuel W. Gross, to this Association, at its first meeting in 1881. He refers to 71 cases of his own which he was able to follow to their end-results. Thirty-five of these patients are still alive, having outlived the 3-year period. Three died of intercurrent disease not cancerous. The remainder died of cancerous metastases.

Reference is also made to late recurrences, in one case 13, and in the other 16 years, after primary operation.

Dr. J. C. Oliver

Cincinnati

Dr. J. C. Oliver gave complete histories of 35 patients upon whom he had operated for carcinoma of the breast. The patients were all women. The histories of the living patients were complete to April 1, 1907. No case was reported which had not passed the 3-year limit, or which had died before the expiration of that length of time after an operation had been performed.

Twenty-two (62.85 per cent) of the patients are dead. Twelve (34.28 per cent) are alive and well from 3 to 10½ years after operation. One is alive more than 3 years after operation, but has an inoperable recurrence.

The radical operation, without removal of the supraclavicular glands, was performed 30 times. The breast was removed and the axilla cleared out 7 times. (The two additional operations are accounted for by the fact that the remaining breast became involved in 2 patients, and these were subsequently removed.) The percentage of recovery after radical operations was 33⅓; that after the simpler operations was 57.15.

The reports prove that recurrences and death are unusual after the patients have remained well for 3 years subsequent to operation. But 3 cases died after 3 years of immunity — these lived respectively 5, 4, and 3½ years.

Three patients developed recurrences or metastases after 3 years, 4¾, 3½, and 3½ years, after operation. Two or more operations were performed upon 8 of the patients. Three of these patients are alive and well more than 3 years after the last operation. Twenty-one of the patients had known of the existence of a tumor for 1 year or longer. Fourteen (66⅔ per cent) are dead; six (28.5 per cent) are alive and well. One is alive but with an inoperable recurrence.

Eight patients knew of the existence of a tumor from 6 to 12 months prior to operation. Four (50 per cent) are alive and well. Six were operated upon in less than 6 months after the recognition of a tumor. Two (33⅓ per cent) are alive and well; 4 (66⅔ per cent) are dead. Recurrence above the clavicle took place in but 2 patients. The remaining breast was the seat of recurrence in 5 patients. Lymphedema supervened in 5 patients. Three died, 1 is alive with recurrence, and 1 is alive and well 5 years after operation.

The mortality was least in those patients in whom the tumors were located in the central area of the breast, and in those where tumors were in the lower third of the breast. The average duration of life after operation in fatal cases was 20 months. The average time of recurrence was 14¼ months. Fourteen of the 35 patients were afflicted with the disease so extensively as to give no promise of cure by operation. When these are eliminated from the statistics the author's percentage of recoveries is 57.6 per cent.

The author concludes that the most potent factor in prognosis is the histologic character of the neoplasm. The prognosis becomes better when dealing with the hard, fibrous, slowly-growing varieties.

Dr. Joseph Ransohoff

Cincinnati

Dr. Joseph Ransohoff presented a paper on "Very Late Recurrences after Operation for Carcinoma of the Breast," in which he shows that 20 per cent of patients passing the triennium of safety still had recurrence either in scar or died of metastases. After 5 years recurrence is less common. Eighteen of the Fellows of the American Surgical Association have seen no recurrence after 5 years. The essayist presented a case in which the disease returned in the scar 21 years after the first operation. A second operation at this time was followed by return of the disease within a year, and death from pulmonary carcinoma a year later.

To ascribe the improved end-results now obtained altogether to the radicalness of the operation is fallacious. The public has been educated to the dangers of delay and primarily bad cases, the ulcerated for example, are very rarely seen in advanced communities.

The author collected from the Fellows of the Association, including his own, 37 cases developing 7 years or more after the first operation. Of

these 26 were clearly local and 11 were doubtful. He would not include cancers of the other breast or of internal organs, like the stomach or uterus, as recurrences. Of clean local recurrences, 10 occurred during the seventh and eighth years, 2 after the 9th, 10th, 11th, 12th and 15th years, and one each at varying intervals from 15 to 25 years.

Dr. Thomas R. Neilson

Philadelphia

Dr. Thomas R. Neilson presented a paper on "Four Cases of Rupture of the Kidney; with Remarks upon Conservative Operative Treatment." The four cases occurred in the experience of the author at the Episcopal Hospital, Philadelphia.

Case 1. A farmhand, age 25 years, admitted to hospital April 14, 1901, having, late on the preceding day, fallen from, and been run over, by a heavy farm wagon which he was driving.

The symptoms on admission were: Pain in the left chest (due to fracture of tenth rib), hematuria; distension of the abdomen with muscular rigidity, especially in the lower part; temperature 99°, pulse 80, respiration 40. Later in the day the patient presented evidences of continuing hemorrhage, and increase in the abdominal condition.

The abdomen was opened through the left rectus muscle, and found to contain a large quantity of blood and clots. None of the viscera were injured and the source of bleeding was the left kidney which was ruptured, the peritoneum in front of it being torn. A gauze pad, placed against the kidney through the opening in the peritoneum, controlled hemorrhage, while the abdominal cavity was cleared of blood and clots and the wound closed, a glass drainage tube being inserted into the pelvis. An oblique lumbar incision was then made, blood and clots removed from the region about the kidney, and the latter examined. A number of lacerations were found, chiefly in the lower half. Strips of iodoform-gauze packed firmly about the kidney stopped the bleeding.

Normal saline solution was given during the operation both by intravenous transfusion and by hypodermoclysis. Immediately after operation the condition was critical, but the patient soon improved and gradual recovery took place, a fistulous tract which formed, finally healing on July 17.

Case 2. A boy, 16 years old, struck in the right hypochondrium and on the head by the fender of a trolley car.

On admission there were pallor, dilated pupils (but responding to light), some abdominal pain and distension, no muscular rigidity, hematuria. Vomiting occurred during the night. The general condition was much improved by the next day, and there was less pain. On the following day, the patient complained of great abdominal pain and tenderness in the loin had increased.

Operation was then done. Abdomen opened through right rectus muscle. Nothing found but a small quantity of blood which had come from the kidney through a tear in the peritoneum. Abdominal incision was closed and an oblique lumbar incision made, blood and clots removed and the kidney found almost bisected by a transverse tear. Hemorrhage was severe. Firm packing with gauze arrested it.

The patient did well until the twelfth day, when after dressing and removal of the last of the guaze a violent secondary hemorrhage occurred. Repacking of the wound, intravenous transfusion of normal saline solution, and stimulants failed to cause reaction, and the boy died 8 hours later.

Case 3. A laboring man, age 50, working at a coal wharf, was struck in the back by a heavy iron bucket and was taken at once to the hospital where he was admitted on Decembec 17, 1904. There was a large hematoma in the right lumbar region, which was exceedingly tender, and the patient voided urine containing a large amount of blood.

Immediate operation was done, the kidney being exposed and delivered through an oblique lumbar incision. There were a number of lacerations of the convex border and of both the anterior and posterior surfaces, as well as several contusions. The transverse processes of the first and second lumbar vertabræ and the last two ribs were fractured. Pressure upon the pedicle of the kidney controlled bleeding, while loose fragments of bone were removed, and the sharp bases of the fractured transverse processes cut off with bone forceps. The kidney was returned, firmly packed with strips of iodoform-gauze, and the wound partly sutured.

The patient did well and was discharged from hospital on February 11, 1905.

Case 4. A boy, 6 years old, fell from a pile of lumber. When brought to hospital, he was pale, and complained of pain in the left lumbar region, where he was tender to pressure. Bloody urine was obtained by catheter.

Operation was immediately done. Oblique lumbar incision was made and the kidney delivered. There were a number of small tears of the convexity and anterior surface, but it was most severely injured at its lower pole, from which a large piece was entirely detached. This was removed. The kidney was replaced, being firmly held by hammock strips of gauze at its poles, and

gauze was firmly packed against it, entirely controlling the bleeding.

The patient did well after operation. For a time urine was discharged from the wound, but only for a few days. The wound was completely healed, and the boy was discharged from the hospital in 51 days.

In connection with these cases mention was made of a case, which also occurred in the experience of the writer, of a severe rupture of the liver associated with rupture of the right kidney, the result of a fall. This case was reported to the Philadelphia Academy of Surgery in April, 1903.

The patient was not seen until the third day after the injury. Gauze packing of both kidney and liver wounds stopped the bleeding and recovery took place.

A brief allusion was made to some of the more comprehensive contributions to the literature of injuries of the kidney, beginning with the study by Maas, in 1878, of 71 cases, Dr. F. S. Watson, in June, 1903, published a paper analyzing 660 cases. The writer has been able to find but 30 cases published since then, 16 being included in a table published by A. H. Barkley, in February, 1907. The four cases now reported raise the number to 34.

The highest mortality in subparietal injuries of the kidney is in the cases not treated surgically.

Comparison of the results of conservative operative procedures and nephrectomy, including the statistics of Watson, is made. The results of operations other than nephrectomy give a far smaller death rate than the latter. This may be thought to be largely due to the fact that in the former group of cases the injuries were less severe than in in those treated by nephrectomy. He does not think that this applies to many of the cases, however.

Surgical interference in rupture of the kidney is called for in the first place, for the control of hemorrhage and the prevention of extravasation of blood or of urine into the tissues, or into the abdominal cavity, in case the peritoneum be torn; secondly, for the treatment of injuries of other organs in addition to those of the kidney which may have occurred; third, to place the kidney, whenever possible, under circumstances most favorable to repair; and lastly to provide means against the occurrence of infection.

If there are grounds for believing that hemorrhage is taking place — lumbar tumefaction, severe or persistent hematuria, evidence of fluid in the abdomen, constitutional signs of hemorrhage, and indications of complicating abdominal injury — operation should be done without delay.

Expectant treatment is permissible only when local symptoms are insignificant and slight hematuria alone indicates renal injury. The choice between abdominal section and lumbar incision must be made upon the merits of individual cases, but if laparotomy be done, the loin should be opened for drainage.

Nephrectomy will be necessary if the kidney is so injured as to be mostly pulpified, if one of its principal blood-vessels is torn, or if it be surgically diseased. But when the injury consists of a single, or even two clean tears, nearly dividing the kidney, or when, as more often happens, there are several, or many more or less deep lacerations and contusions, not devitalizing the organ, an effort to save it is justified, if there are fair grounds for believing that there is reasonable hope of repair. If a portion only of the kidney be badly mutilated, partial is preferable to complete removal.

Hemorrhage can be thoroughly controlled by packing with gauze, either plain sterile or iodoform-gauze, which can be quickly done, and serves well for drainage, although any dead spaces in the perirenal region outside of the packing should be drained by rubber tubing.

Suture of the kidney wounds is applicable instead of packing in only those cases in which there are one or two clean tears, but not for ragged lacerations. It has been done only 10 times in 125 recorded cases of conservative surgical treatment. Recovery from operation in all was prompt, a much shorter time being required than in cases treated by packing, but in 2 the ultimate results were not good, a fistula in one (Watson) and secondary nephrectomy was required in the other, with a fatal termination. In spite of the abbreviation of the period of recovery by suturing of the renal wounds, the number of cases to which it is suited will be small, and gauze packing, satisfactory both for hemostasis and drainage, must be relied upon in the larger number.

Dr. Charles A. Powers

Denver, Colorado

Dr. Charles A. Powers read a paper entitled "Primary Sarcoma of the Prostate."

His patient was a man of 60 years who had had no bladder trouble until 2 months before seen, at which time he began to notice a little pain and discomfort on urination, and began to rise in the night to urinate. Symptoms rapidly increased and coincidently the patient lost flesh and strength.

On examination the man complained of constant severe pain in the hypogastric region with a constant pain, less severe, in the recto-perineal region. He was urinating about every 1½ hours,

urination being attended by increasing difficulty and pain. The urine was entirely normal. Catheterization found no residual urine whatever. Rectal examination revealed a very large rounded, slightly nodular balloon-like prostate. The finger did not reach the upper margin. The impression gained on digital examination was an unusual one. A tentative diagnosis of sarcoma was made. Operation performed February 12, 1907, perineal prostatectomy. The finger entering the mass through the prostatic urethra began the process of enucleation, which was attended by profuse, alarming hemorrhage. This was difficult to check. Frequent hemorrhages obliged one to stop and pack. Nowhere could a lead be gained between gland and capsule. Friable masses were reamed out from both sides of the gland; these had to the eye the appearance of sarcoma. It was not possible to entirely get beyond the growth. The patient succumbed to a double pneumonia on the fifth day. Histologic examination of the growth made by Rev. J. A. Wilder, showed it to be a small round-celled sarcoma.

A careful search of the literature revealed but 19 additional authentic cases of primary sarcoma of the prostate microscopically proven. Twelve of these were in children under 15 years of age, 7 of them were of the small round-celled type. Each of these cases succumbed to operation or to a recurrence of the growth.

Dr. George Emerson Brewer

New York

Dr. George Emerson Brewer presented a paper on "The Etiology of Certain Cases of Left-sided Intra-abdominal Suppuration (Acute Diverticulitis)." The following is an abstract of this paper.

Three cases of the left-sided intra-abdominal abscess were reported by the writer, in which no definite cause for the infection could be ascertained at the time of operation. In a fourth case a very definite cause for the symptoms was found. The history of this case was briefly as follows:

A man, 48 years of age, was attacked with a sudden right-sided abdominal pain associated with nausea and vomiting. These symptoms continued during the night, and on the following morning there was intense, well-marked tenderness in the lower left quadrant of the abdomen. There was no abatement of the symptoms during the following 24 hours, at the end of which he was found to have an elevation of temperature and increase in the pulse rate, and all the evidences of a mild infection. When seen by the author 2 or 3 days later, there was well-marked rigidity of the left rectus muscle, tenderness on palpation throughout the left half of the abdomen, and a distinct mass in the neighborhood of the anterior-superior spinous muscles of the left side. Under ether anesthesia the abdominal wall was incised and a large abscess encountered, which lay to the outer side and behind the descending colon and sigmoid. This abscess contained several ounces of foul-smelling pus, and in the bottom of the abscess cavity was a definitely formed fecal concretion about the size of a date seed. Careful inspection of the abscess wall showed a small perforation into the sigmoid.

A fifth case was that of a man 58 years of age, who was admitted to the Roosevelt Hospital with a diagnosis of acute appendicitis, with generalized peritonitis. On examination the abdomen was everywhere distended and tender, generalized muscular rigidity was present. On opening the abdomen the cavity was found to contain a large amount of foul-smelling pus, the intestines were everywhere injected, and in places covered with fibrin. The appendix showed no definite lesion, but on removing the intestines from the pelvic cavity a perforation of the sigmoid was found, and in the immediate neighborhood an oval fecal concretion about the size of an orange seed was detected. The rent in the sigmoid was closed, the abdomen washed out, but the patient died at the end of 48 hours.

From these cases the writer concludes that a rupture of an acquired diverticulum of the descending colon or sigmoid not infrequently gives rise to symptoms of intra-abdominal infection, simulating the appendix very closely. In fact, in the first 2 of his cases the writer was inclined to regard them as cases of appendicitis with transposition of the viscera.

Acquired diverticula of the colon are not unfrequently observed in elderly people, particularly in those who have suffered from chronic constipation. The diverticula are multiple, varying in size from a small pea to the size of an English walnut. These pouches are herniæ of the mucous membrane through the separated fibres of the muscular coat. They not unfrequently contain fecal concretions.

During the past 50 years a few cases of inflammation from gangrene and perforation have been reported by pathologists, but these reports have either been buried in the records of pathological societies, or have been published in journals not largely read by clinicians. For this reason practically no mention of this condition is found in our text-books, or in current literature. While inflammation of the congenital diverticula has been recognized for a very considerable period of time,

the importance of the acquired diverticula from a pathologic point of view, has not been appreciated by the profession.

DR. C. A. PORTER AND DR. C. J. WHITE
BOSTON

Dr. C. A. Porter and Dr. C. J. White presented a paper on "A Case of Mulitple Carcinomata Following Chronic X-ray Dermatitis." This article reviews 10 cases found in the literature on the subject, and presents in detail an additional case of the authors'.

They state that the clinical appearances of the chronic X-ray dermatoses suggests a precocious and extreme senility of the skin; that microscopic examination also shows the most extraordinary changes, always of a degenerative character, unequalled in their severity and chronicity, by the effects of any other agent.

In view of these facts and the histories of the 11 cases reported Dr. Porter has reached the following conclusions:

1. For the atrophic condition of the skin and the telangiectases nothing can be done.

2. Hypertrophic changes, keratoses and warts, may, with safety, be treated in the usual manner. If such treatment fails, excision with or without skin grafting, will probably relieve the pain and result in a cure.

3. Excision and grafting will prove to be the best treatment for recurrent fissures.

4. All ulcerations which, under ordinary treatment, remain open after 3 months, should be thoroughly excised, and very carefully examined. The subsequent treatment, to be determined by the result of the microscopic examination, should be skin grafting, further excision and grafting, or amputation.

5. As the history of almost all of these cases of severe and chronic dermatitis dates back to early exposure, with the protection which our present knowledge demands, it is to be hoped that the number of victims of too enthusiastic work in an untried field, will steadily diminish.

6. In the meantime, there is no hesitation in recommending the *early excision of all persistent X-ray ulcerations*, in order that subsequent malignant degeneration may be prevented.

CHICAGO GYNECOLOGICAL SOCIETY

FRANK W. LYNCH, M. D., EDITOR

A regular meeting was held March 15, 1907, with the Pres dent, DR. JUNIUS C. HOAG, in the chair.

DR. M. R. BARKER reported a CASE OF DOUBLE EXTRA-UTERINE PREGNANCY.

CLINICAL HISTORY

Mrs. D. aged 38 years. One child living, aged 19 years. One miscarriage 15 years ago, and one abortion 10 years ago. Patient has always been well and desired children. No gynecological troubles elicited. In February, 1906, patient was indisposed, but menstruated normally at the regular time. She could not account for her indisposition as it was so unusual for her to be ill.

During the month her physical condition became more aggravated. She became very nervous and greatly depressed at times. On the 29th of March she passed something from the uterus she supposed was a fetus. This was accompanied with considerable hemorrhage. Close questioning, however, revealed the fact that what she passed did not resemble in any way a fetus. It was a fleshy substance having no form or likeness to a fetus, but, in the language of the patient, resembled a very large heart of a chicken. This supposed abortion did not relieve her condition in any way. Patient menstruated normally this month.

In April she menstruated at the regular time, but the menstrual season was prolonged from three days, her usual time, to two weeks. During this month she felt a constant weight or fullness, as she expressed it, in the pelvis, with at times a frequent desire to urinate, and at other times an irresistible desire to move the bowels but without results. During the latter part of this month she had instantaneous darting pains through the right side of the pelvis.

In May she did not menstruate at all. During this month at different times she had severe pains in the right pelvic region, some of which were accompanied with marked prostration. There were many of these attacks of pain and prostration during the month of May. During this month defecation and micturition were at times very painful.

Her menstrual period appeared in June at the regular time, but did not completely stop after that. On June 18, she passed another fleshy

substance from the uterus which resembled in size and appearance the substance passed on March 29. This was also accompanied with hemorrhage. The clinical history of June was characterized by marked tenderness over the lower abdomen, great distress accompanying defecation and micturition, severe pains through the pelvis with marked prostration and constant flowing.

The flowing became more profuse at the regular menstrual time in July, and continued so for a few days, when it slackened but did not entirely stop. The pain in the pelvis became more excruciating during the first part of July. Sometimes she became very faint and greatly blanched during these attacks of pain.

I first saw this patient July 14, 1906. Physical examination revealed a tumor extending from the median line in the pelvis out nearly to the crest of the ilium on the right side. The tumor was movable, very tender to touch, seemed about three inches in diameter and five inches long. The uterus was fixed in the median position but crowded to the front. The posterior cul-de-sac was filled with a boggy mass which was extremely tender to touch. Bimanual examination detected fluctuation in this mass; everything was so masked by it, however, that it was impossible to differentiate, except indistinctly, the pelvic organs by vaginal examination. Rectal examination was so painful, we were compelled to desist, without results.

I believed the tumor before described was the distended right tube. From the history and examination, I believed that we had to deal with an extra-uterine pregnancy of the right tube, which had ruptured sometime during the month of May, which, though not causing sufficient hemorrhage to destroy the patient's life at once, had been bleeding much of the time since and had filled the posterior cul-de-sac with blood-clots. Thus was produced the boggy mass revealed by vaginal examination, and the pains, prostration, and fainting spells that had characterized the malady. I advised immediate operation, which was accepted. The patient entered the Chicago Hospital on July 15, 1906, and on the 19th, after preparing the patient as thoroughly as was justifiable in the case, I operated and removed a quart of blood-clots from the posterior cul-de-sac. This clot had become organized so that the sigmoid was adhered to it for a space of five inches. These adhesions were broken up and the clot removed. The right tube was distended with a partially organized blood-clot, much resembling in size and shape a medium-sized Bologna sausage, on the lower or most dependant border of which was a tear through its wall one inch long, through which blood and serum were constantly oozing into the posterior cul-de-sac. The fimbriated end of this tube was widely dilated, through which the organized clot that filled the tube extruded. This tube and contents were removed. There were no traces of a fetus found in the tube nor in the escaped blood-clot in the posterior cul-de-sac. Fig. 1 represents this tube fairly well when removed. On examining the left tube, I found it greatly distended and seemingly ready to rupture. I removed this tube and contents. Fig. 2 fairly represents this tube when removed. An examination of the contents of this tube revealed an amnionic sack containing less than a drachm of fluid, and a fetus, a little less than 4 cm. in length or about ten weeks old. The pregnancy in this tube had been uninterrupted up to this time. After placing a large drainage tube in the posterior cul-de-sac and vagina, we closed the abdomen in the usual manner.

From the operative findings in this case we can only make the following positive diagnosis: Hematosalpinx of the right tube with rupture of the tube, followed by long-continued hemorrhage into the posterior cul-de-sac, with organization of the clot and adhesions of the sigmoid to it, and an extra-uterine pregnancy of the left tube.

From the combined clinical history and operative findings, we are justified in making the following diagnosis of the condition in the right tube: Extra-uterine pregnancy of this tube, which pregnancy commenced in February and was interrupted in May, either by rupture of the tube or by tubal abortion. This diagnosis is substantiated by the following clinical history and operative findings: Constantly increasing indisposition, commencing in February; the passage of the fleshy mass (or probable decidua) the 29th of March; bearing down in the pelvis, with rectal and vesical irritation; sharp shooting pains through the pelvis, followed by more prolonged seasons of pain and marked prostration that commenced in May; disturbed and prolonged menstruation in April, and failure to menstruate in May. The further pains and fainting spells that occurred up to the time of the operation were due to the further distension of the tube with blood-clot and frequent hemorrhages. The operative findings justifying this diagnosis are the following: The enormously distended tube with a partially organized blood-clot; a rupture of the tube an inch long through which blood and serum were escaping; the fimbriated end of the tube widely distended by the protruding clot; the retro-uterine hæmatocele.

The following conclusions regarding the condition in the left tube are also justified by the

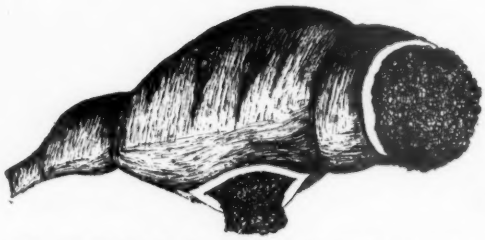


Fig. 1. Right tube, in which no evidence of pregnancy was found, except clinical and operative.

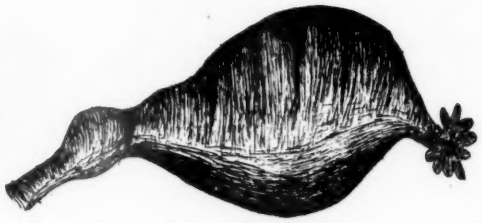


Fig. 2. Left tube, in which fetus was found and microscopic evidences of pregnancy.

clinical history and operative findings. The pregnancy at the time of operation in this tube was about ten weeks old and uninterrupted. The amount of amnionic fluid and size of fetus would not indicate a greater age. The passage of the membrane from the uterus on June 18th was doubtless the decidua of this pregnancy, which decidua, doubtless, was passed about six weeks after conception took place in the tube. This would be about the usual time for the passage of the decidua. From the clinical and operative findings then, in this case, as a whole, we are justified in making the following conclusions:

The case was one of double extra-uterine pregnancy, the two pregnancies going on at the same time but of different ages. The conception in the right tube having taken place in February, the decidua passing on March 29th, and the pregnancy terminated by the rupture of the tube, or by tubal abortion, when the fetus was about ten weeks old. Conception took place in the left tube about the first of April. The decidua of this pregnancy passed June 18th, or about six weeks after pregnancy took place, and was uninterrupted up to the time of operation, which was July 19th.

So far as I am able to find, there has been no case of extra-uterine pregnancy like this reported. There are a number of cases reported in which there was a twin extra-uterine pregnancy, both tubes being impregnated at the same time, and cases reported of twin pregnancies in the same tube. There are also cases reported in which one tube became impregnated, and several years after the other tube also became impregnated; but I am unable to find another case wherein one tube became impregnated, and during all the disturbances, both local and general, due to such a condition, the other tube also became impregnated, both pregnancies going on at the same time but of different ages. This patient made a perfect and uninterrupted recovery, returning to her home in another city ten days after the operation.

A question arises in this case: Was there a pregnancy in the right tube, or was the hematosalpinx that existed here and the pelvic hæmatocele due to some other cause? The fetus was not found, though searched for in the tube and in the blood-clot. This is not surprising, as the fetus may have escaped through the fimbriated end of the tube, or through the rupture of the tube, into the abdominal cavity and been lost or absorbed. To clear up this point, if possible, I took both tubes to Professor Zeit for microscopic examination. His examination shows positive evidence of pregnancy in the left tube, where we had before found the fetus, and where the tube was not ruptured, but shows no evidences of a pregnancy in the right tube, where we did not find a fetus and where the tube had been ruptured long before. His examination only shows a salpingitis of the right tube.

Another question: When pregnancy has taken place in a tube, will that tube always after show positive microscopic evidences of that pregnancy? No, it will not. If not, when do these evidences cease to exist? We don't know. This being true, the microscope proves nothing, positively, either for or against the theory of pregnancy is this case, as all microscopic evidences of pregnancy may have disappeared from the right tube before the examination was made; for, according to our clinical calculations, pregnancy was terminated in this tube from eight to ten weeks before the tube was removed. While we are, therefore, unable to establish positively a diagnosis of extra-uterine pregnancy of the right tube in this case, by finding the fetus or by use of the microscope, the clinical evidence and operative findings so strongly favor this conclusion that no other is tenable, in my judgment.

For the further substantiation of this view, we may with propriety quote from the writings of men of recognized ability upon this subject:

Medical and Surgical Gynecology, Pozzi, vol. ii, page 241.—"The course of development of tubal pregnancy varies. In exceptional cases, the embryo perishes at an early date and is so completely

disintegrated that no trace of it can be found. The sack no longer increases in size, but may be transformed into a hematosalpinx by the internal hemorrhage, which has caused or accompanied the death of the embryo. The clinical characters and prognosis of the lesion, of course, vary greatly. The surgeon who later performs an operation for its extraction often finds the greatest difficulty in establishing its true nature, even by microscopic examination of the walls, in which there are usually a few chronic villi to be found. Even complete absorption of the contents of the tube may occur after a longer or shorter interval."

Operative Gynecology, Kelley, vol. ii, page 440.—"In rare instances very little hemorrhage accompanies the tubal abortion, and the fetus and its membranes may be extruded *in toto* through the fimbriated extremity."

Obstetrics, Williams, page 542.—"Rupture as a rule, occurs in the neighborhood of the placental site, and may take place either in the peritoneal cavity or between the folds of the broad ligament. In the former case the entire ovum may be excluded, or remain in the tube."

Ibid, page 544.—"As has been pointed out, absorption is the universal fate of small embryos which are extruded into the peritoneal cavity, unless the placenta retains its attachment to the tube wall and still offers conditions suitable for the continuance of the circulation. Moreover, the young fetus is frequently absorbed while still in the tube, as is shown by the fact that upon opening early gestation sacs it is sometimes represented by an amorphous mass of tissue attached to the umbilical cord. At times the only indication of its previous existence is found in a small portion of the cord hanging free in the amniotic cavity.

Diseases of Women, Dudley, page 448.—"The symptoms of tubal abortion and rupture are those of pelvic hæmatocele. The relations of hæmatocele to tubal gestation are most significant; the former has been defined as an accumulation of blood in the pelvis proceeding from rupture of a pelvic vessel; in the vast majority of cases, at least, it is due to tubal abortion or rupture."

Heineck, SURGERY, GYNECOLOGY, AND OBSTETRICS, February, '07, page 175.—"Retro-uterine hæmatoceles are usually due to extra-uterine pregnancy."

Practice of Gynecology, Bovée, page 700.—"Hæmatocele with very rare exceptions are results of ectopic gestation."

Diagnoses Diseases of Women, Findley, page 169.—"Pelvic hæmatoma and hæmatocele not due to ectopic pregnancy are exceedingly rare.

Text Book on Diseases of Women, Penrose.—"Hematosalpinx not caused by tubal pregnancy is very rare."

DR. ROBERT ZEIT'S REPORT ON THE CASE.

One of the Fallopian tubes (the right), submitted for examination, is 10 cm. long, 3 cm. in diameter and tortuous. It was received opened and empty, isthmus tied with catgut. Fimbriæ, adherent by dense fibrous tissue to a portion of the ovary which shows a corpus luteum. Sections show congested blood-vessels, dipedesis, and much small cell infiltration in mucosa and muscularis. *Diagnosis:* Endosalpingitis and mesosalpingitis.

The fimbriæ of the other tube (on left tube) are adherent to a portion of ovary, removed with part of the tube, ampulla dilated, containing a globular mass, 4 cm. in diameter; appearance of clotted blood adherent to wall of tube with some shreds of fetal membranes. Sections show chorionic villi. No decidua cells can be found in any of the sections from different parts of the tube. Muscularis hypertrophic. The globular mass consists principally of a fibrous network with red blood corpuscles (clotted blood) with here and there a few chorionic villi, showing distinctly the layer of Langhan's cells and syncytium. *Diagnosis:* Graviditis ampullaris.

THE PRESIDENT: I would inquire whether it is well-established that there is a decided predisposition to a repetition of extra-uterine pregnancy? What do you think about that, Dr. Martin?

DR. FRANKLIN H. MARTIN: I have been much interested in Dr. Barker's report, and while he is justified in believing he had a double extra-uterine pregnancy, beginning at different periods and developing at the same time, of course, as he has definitely stated, it is impossible for him to demonstrate it. It is, as the essayist noted, not an unusual thing for extra-uterine pregnancies to occur at different periods of life in the same individual. Several years ago Professor H. T. Byford reported before this Society one or two such cases on which he operated for extra-uterine pregnancy after the primary rupture, and found evidences of previous extra-uterine pregnancies.

DR. JUNIUS C. HOAG: I know of one case where a patient was operated on for extra-uterine pregnancy, and the question arose whether the other tube should be removed to prevent possible extra-uterine pregnancy on that side. The tube, however, was not removed, and the patient subsequently underwent another operation for an extra-uterine pregnancy on that side.

DR. HENRY F. LEWIS: I do not think the essayist has proven to us by the recital of this case that there were two pregnancies. We cannot always

make a correct diagnosis of extra-uterine pregnancy from the clinical symptoms and signs. I think we can throw aside, from scientific consideration, the proof of extra-uterine pregnancy from the clinical aspects of the case. The operative findings may show us what we can see with the naked eye, and from that picture the case looks like one of ectopic pregnancy. He found well-organized blood-clots. The changes in menstruation prove nothing, because we know that women with extra-uterine pregnancy may menstruate or not. Microscopic examination of the right tube does not rule out the fact that there might have been ectopic pregnancy; yet it by no means proves it. The burden of proof rests upon the essayist to show that there is such a thing as ectopic pregnancy, occurring in two tubes at the same time at different ages, which he considers a unique case. Gross examination showed there was ectopic pregnancy in the left tube, because he found the fetus in the amniotic sac. While it is generally believed that the great majority of cases of hematosalpinx are due to ectopic pregnancy, there are some cases that are not; they are due to something else. There may be other reasons for hemorrhage occurring in the tube, or even for a tube to rupture from the large amount of blood it contains. I think the essayist has only proved to us that ectopic pregnancy occurred in one tube and hematosalpinx in the other.

TUBO-OVARIAN ABSCESS

Dr. Frank T. Andrews: I want to present a specimen of tubo-ovarian abscess. The case is interesting because the abscess is of streptococcic origin. The pus from the abscess showed nothing but swarms of streptococci. Ordinarily, in pyosalpinx we seldom find the streptococcus. It is only in seven or eight per cent of the cases that we find streptococci or staphylococci, but more often it is the staphylococcus that is present.

The patient came down last August with an acute double pyosalpinx, which ran the course of an acute pelvic infection and ever since has pursued a chronic course. She was admitted to the hospital last night in a bad condition, and I operated this morning. The right Fallopian tube was pretty well obliterated, or at least empty. The left Fallopian tube was full of pus and multiple punctate points, with masses of adhesions round about it, so that the abscess was not single. The tumor, which contained about three pints of pus or more was in the right ovary; the left tube contained an abscess, filling the whole of the pelvis, the cul-de-sac of Douglas, and up almost to the umbilicus.

I present the case as rather interesting on account of the streptococcic infection and because it is a tubo-ovarian abscess, with no opening between the tube and the ovarian abscess. Incidentally, this is a case of calcification.

Dr. Herbert M. Stowe read a paper (inaugural thesis) entitled Prolapse of the Cord, With a New Method of Treatment. (See paper, *ante*, p. 96.)

DISCUSSION

Dr. Rudolph W. Holmes: There is no question but that Dr. Stowe has presented an ingenious contrivance, which is a distinct improvement of our obstetric hydrostatic bags. I believe its application has a far wider field of usefulness in cases in which the cord is not prolapsed than where it is. With the ordinary bag *in situ*, with the membranes ruptured, and the waters drained away, dilatation must be carried out practically by means of the so-called vertebral pressure of Lahs: whereas, if Dr. Stowe's bag be employed, and the amniotic sac filled with salt solution of a specific gravity approximating that of liquor amnii, the dilatation by means of the bag will be almost identical with the normal bag of waters. But the great objection to this bag is, as with any bag, in prolapse of the cord, that necessarily there must be absolute reposition of the funis before it can be used. If the cord is in the vagina, it must be put above the head; and to do this the os must be dilated sufficiently to admit the hand in most instances — here the bag would not be needed. If the waters have drained away for some time, the os being only slightly dilated, a bougie perhaps could not be used to get the cord above the head; of course, without preliminary reposition of the cord, the bag would cause the same dangerous compression as the advancing head. Bumm is the only one, so far as I can recall, who considers funic prolapse to be an indication for vaginal Cæsarean section. I took issue with him in a paper on vaginal Cæsarean section presented to this Society, that at the time when prolapse of the cord was recognized, and then preparations made for the operation, the baby's life was so in jeopardy that it was really unjustifiable to attempt vaginal Cæsarean section, with its material maternal mortality, in the forlorn hope of saving a moribund baby — a baby should be in perfect condition to warrant such a severe operation as a vaginal section in an attempt to save it.

Dr. Joseph B. De Lee: Any addition to our obstetric knowledge of the treatment of prolapse of the cord is particularly welcome, because heretofore the mortality has been persistently high, about fifty per cent for the infants.

The method recommended by Dr. Stowe is very ingenious and, I think, has a field. I do not believe, however, it will wipe out all the mortality

in cases where the cord prolapses before the cervix is dilated sufficiently for its successful reposition. I think a few babies will be saved, even if the cord is not placed above the head, as Dr. Holmes suggested it must be in order to be relieved from pressure; but I think not a few will die as a result of compression of the cord between the head and the lower uterine segment. In other words, I do not believe a bag, even if it prevents the escape of the liquor amnii, will so replace the original conditions that compression of the cord will be always absent. The pressure in the uterus is not equal in all directions. That is only true in cases where the liquid is enclosed in a vessel the walls of which are equally resistant at all parts. If a vessel has an outlet, the pressure of the fluid is less in the direction of the outlet than it is at the point where the pressure is supplied; otherwise, there would be no current in the fluid. As a matter of fact, the pressure of the liquid inside the bag of waters that lies between the head and external os, is less than the pressure above the line of impact of the head on the lower uterine segment. Therefore, if the cord happens to lie in this girdle, even though the bag prevents the escape of liquor amnii, compression will result and perhaps cause death of the fetus. Before the rupture of the bag of waters, in normal cases, the cord lying in the lower uterine segment is subject to a certain amount of pressure. I have no doubt that the instrument recommended is going to be useful. If the salt-solution injected, is of a higher specific gravity than the liquor amnii, the cord might be induced to float to the top of the solution. If we inject liquid of a higher specific gravity than the liquor amnii, the question of whether the osmotic changes which go on in the cord might interfere with the circulation, by causing coagulation in the blood-vessels, would have to be determined by experiment and experience.

There are many other indications for the use of this bag. It would be ideal in shoulder presentations, in breech presentations, before dilatation of the cervix. I think it is an improvement on the ordinary bag, in that we are able to inject salt-solution into the uterus to replace the loss of liquor amnii by the rupture of the membranes.

In the cases reported some important points have been brought up; for instance, the injection of a certain amount of liquid caused a strong uterine action, which led Dr. Stowe to let off some of the water to prevent a rupture of the uterus. The three cases in which it was used are not sufficient on which to base general deductions, but I think the promised success of the procedure warrants its rather extensive trial.

One of the pictures passed around as showing an ideal state of affairs, to my mind illustrates one of the most pathological and most critical conditions we have to meet. Bumm shows in that picture the cord lying between the head and lower uterine segment, just above the greater circumference of the head, just in line for compression by the application of the forceps. It is dangerous for the baby, because it is impossible to feel the cord by the hand, and the cord will be compressed in spite of all precautions on the part of the operator. The cord, to be safe, must be far above the head, and far out of the reach of the blade of the forceps.

Dr. Charles E. Paddock: Anything which will give us a suggestion even of a better, or an additional treatment, for prolapse of the cord, should be welcomed by this Society. The method advocated by the essayist shows considerable original thought, and warrants further investigation. In a hospital practice, or in the hands of a skilled accoucheur, such an instrument could be used or introduced with little trouble in a certain number of selected cases. But that it can be used in all cases of prolapse of the cord, I very much doubt. He advocates the use of the graduated bag, that is, the introduction of one bag first, and then another, and so on, until it is time to deliver the child or until the cord may be replaced. This does not appeal to me as being the particular function of this bag, and in fact I would think that after the first bag has been removed, that the prolapsus might become the more pronounced, and the presenting part still further engaged. The general practitioner is the physician doing the greatest amount of obstetrical work, and who encounters more of these cases than the so-called obstetrician. I do not believe this instrument will be found in his armamentarium, because he would find resort to the other means of effacing the cord which have become familiar to him.

While this instrument is in its inception, let us not in our enthusiasm forget or displace the other treatments which have been of such value to us. I would suggest that where the bag is used the woman be placed in the Trendelenburg position as a further aid to its success.

Dr. Henry F. Lewis: I want to ask Dr. Stowe first with reference to the amount of salt-solution he injected. If the membranes have just ruptured we do not know accurately how much water has escaped, because the amniotic fluid varies greatly in different cases; and how much will we put back? If we put back too much, we run great risk of causing rupture. If the case has gone on and the membranes have ruptured and there have been many pains since the rupture of the membranes, if

the uterus is retracted and thin, it would be dangerous to put back as much amniotic fluid as has escaped, because we are dealing with a smaller uterus. I would like to know the indications for the use of this salt-solution and how much we are to use. There will be an escape of water around the bag between the pains. I know that is the case with the ordinary Voorhees and Champetier de Ribes bags, unless one exerts traction upon the bag between pains. When the head of the child is tightly down in the cervix, the amniotic fluid escapes around the head, in the interval between pains; while if we hold the bag we increase the stimulus of the uterine contractions. That is a method of strengthening the pains and of facilitating labor. We may run the risk of rupturing the uterus, but with this bag we are in a position to aid that much by withdrawing some of the artificial amniotic fluid. I think very highly of this bag. I think it is a bag we should have in our armamentarium instead of the Voorhees bag. It is useful for other purposes besides lapse of the cord.

Dr. Paddock spoke about the general practitioner not having such a bag in his armamentarium. I have always taught that it is just as essential for the practitioner to have a Voorhees bag, a Champetier de Ribes bag or metreurynter, as it is to have his forceps. These bags are not like the ordinary elastic rubber which rots after a few months; they are fortified by canvas between two layers of rubber. I have had them last for a long time, even a year or two. The new ones exhibited by Dr. Stowe may be expensive; but the Voorhees bags are not.

One of the indications against the use of the bag, the Doctor said, was a monster. I do not know why he would not use this bag in dealing with a monster as well as with any other fetus, since it is purely an obstetrical question instead of an ethical one.

Dr. Junius C. Hoag: The essayist has brought forward this evening an ingenious expedient for which I think there is a good, but rather limited, field of usefulness. The device for attempting to prevent prolapse of the cord is by no means new, as the colpeurynter was used for this purpose twenty or thirty years ago. Another device was also used a good many years ago, with at least one successful result, and that was to take an inflatable pessary, introduce it far up into the uterus, and attach the cord to that to prevent any possibility of prolapse. But that, of course, was given up, although there were some good results from its use.

Dr. Stowe failed to state that the true danger of compression is at the pelvic inlet. The degree of prolapse does not make much difference; it does not particularly signify whether we have a presenting or prolapsed cord. If the cord comes down below the pelvic inlet, it is not a place where the greatest danger of compression takes place, and I can scarcely conceive that the bag alone would be adequate to keep the cord up in a safe place without the injection of fluid, provided the natural fluid had already escaped. I believe that there is a useful field for this plan in certain cases in which there is no prolapse of the cord. I, for instance, recently had a case where there was no prolapse of the cord, and the amniotic fluid drained away. I examined the patient to get the heart sounds, and obtained them very clearly one day; but the next day I found they had disappeared. Finding they had disappeared within twenty-four hours, and knowing the mother had no sensation of fetal movements, I told her the child was probably dead, as it was a shoulder presentation. I anesthetized her and prepared her for a version. I felt the cord to see whether it was beating or not, and it was not. The child was clearly dead; I wanted to know whether the cord was beating or not, in order to be guided as to what kind of operation I would perform. In this case I think the cord was compressed between the child's body, high up in the uterus and the uterine wall.

I can think of a possible danger in the use of these bags, because of the fact that on several occasions within my own observation, where we had to use bags in cases of placenta prævia, we had sudden death from embolus, and I have often wondered whether the use of the bags was not possibly responsible for embolism. Theoretically, at least, the procedure is a very useful one; but we must not be deluded with the idea that we can prevent prolapse of the cord with a bag alone. I do not think that is possible.

The method of posture in the reposition of the cord is an old one; but this is certainly a decided improvement upon any device that has been previously brought before us.

Dr. Joseph B. De Lee: In regard to the length of life of the ordinary Carl Braun colpeurynter, I will say that in my armamentarium I have colpeurynters that I have used for three years and have boiled them frequently. If a colpeurynter is thoroughly dried and left in a pasteboard box with talcum powder on it, it will last for several years. I throw them away after a reasonable length of time because they are cheap. On the other hand, the Voorhees bag is less lasting. You can boil it only four or five times before it cracks at the seams. Even those bags are cheap enough to have two boilings pay for the expenditure.

In regard to the treatment of prolapse of the cord, in which Dr. Holmes takes Bumm to task for

proposing vaginal Cæsarean section, I will say that even abdominal Cæsarean section has been carried out in the treatment of prolapse of the cord. In a primipara at full term, with a live baby, with dilatation of the cervix sufficient to admit only two fingers, and beginning effacement, abdominal Cæsarean section offers the best chance of saving the baby, because the probabilities are in that case for the child, there is a mortality of about eighty-five per cent.

The indications for Cæsarean section are broadening rapidly, and when we consider for what simple and unnecessary reasons or conditions the abdomen is opened, by the gynecologist and surgeon, — namely, for obscure pain in the side; so-called enteroptosis; pendulous belly, for which a belly-band would answer all purposes; pain in the back, for which the gynecologist finds retroversion as the cause, which would be all right if left alone and the woman sent to the seashore, — and when we consider the freedom with which operations are done on the ovaries and tubes, and the slight provocation with which the gynecologist opens the abdomen, and with what painful resignation the obstetrician decides to open the abdomen, we must admit there is justifiability in making an attempt to save the baby by abdominal Cæsarean section, because a baby is worth much more than relief from a pain in the back. Vaginal Cæsarean section is not so difficult or so impossible to carry out as Dr. Holmes would believe.

Dr. Junius C. Hoag: I would encourage Dr. Schmauch to purchase these bags because while he may not need them very often, he will be rewarded if he can use one only once in an appropriate case. I have had some Champetier de Ribes bags for five or six years, some of them being in excellent condition now. The old colpeurynter of Braun, being made simply of rubber, will last as long as any rubber will. Any rubber will deteriorate, become friable, and break after a year or two. But these bags will retain their usefulness much longer, while we are simply keeping them for an operation, than the colpeurynter. Is it not so?

Dr. Joseph B. De Lee: No, sir. I will bring down at the next meeting some colpeurynters I have had for four years; old-fashioned Carl Braun colpeurynters which I have boiled perhaps twenty times.

Dr. Hoag: I have kept them for several years myself.

Dr. Rudolph W. Holmes: I believe Dr. Voorhees has made the statement that in the Sloane Maternity his bags (the same set) had been used for nearly two years, and that they were still in excellent condition; the Sloane school use rubber very extensively. I would hazard the statement that these bags were used not far from one hundred times. The Champetier de Ribes bag has proven in my hands to be an abomination. Either the silk is too thin, or rubber rots silk, for I once bought a new bag, used it with a disaster, as it broke within the uterus. On complaining to the instrument man, he showed me others which I broke in turn — none was over-distended. As to the Braun bags: Boiling very rapidly deteriorates rubber; after the bags have been used a few times the rubber loses its elasticity. Aside from this objection, elastic rubber bags have the additional disadvantage that they may slip through an os only partly dilated.

There is one man, Rühl, who went Dr. De Lee one better. He performed a vaginal Cæsarean section with the single assistance of a midwife — he makes a section in about fifteen minutes(!) from the beginning to the end of the operation. The fact of the cord being in the vagina is a very unpleasant complication — it probably will get in the field of incision, may be compressed by the specula as well as by the presenting head. One operator of whom I know reported a section which he had done in a few minutes, when by the clock it actually took him over an hour and a half. Of course, in eternity an hour and a half is only a few minutes. (Laughter.) While I would not be considered as advocating it, abdominal Cæsarean section would appear to be more rational in these cases than that done by the vaginal route.

Dr. Franklin H. Martin: The statement made by Dr. De Lee should not be allowed to go unchallenged by the gynecologist. The gynecologist, when he operates for a "pain in the back or for enteroptosis," realizes the importance of having at hand an experienced abdominal surgeon; and that he usually has in himself. The obstetrician, on the other hand, when he is called upon to do an operation that requires an abdominal section, ought to realize that he has not an experienced abdominal surgeon at hand. Therefore, it is unwise for the expert in obstetrics, one who is not expert in abdominal surgery, to advise a general policy of opening the abdomen by obstetricians, unless he has at hand an experienced gynecologist and abdominal surgeon.

Dr. George Schmauch: I was glad to hear what Dr. De Lee said with reference to vaginal Cæsarean section for placenta prævia. I reported a case to the Society two years ago in which I did that operation, but at that time Dr. De Lee thought there was something radically wrong. I am glad to know that he has changed his mind.

Dr. De Lee: The first diagnosis I made was placenta prævia; but when we got the woman on

the table, we changed the diagnosis to detachment of the placenta. I would have done version if it had been a case of placenta prævia.

DR. SCHMAUCH: I understood you to say that the case was one of placenta prævia.

DR. DE LEE: There was a low insertion of the placenta.

DR. SCHMAUCH: With reference to Dr. Stowe's paper, it is astonishing to notice the great mortality in transverse presentations. I regard prolapse of the cord, of very little importance in transverse presentation. The length of the umbilical cord has undoubtedly something to do with the causation of prolapse of the cord. However, one short cord that is prolapsed is sufficient proof that the length is not an important etiological factor in prolapse of the cord.

I understood Dr. Stowe to say that the quantity of liquor amnii, after delivery of the child, has not been measured. Exact measurements have been made in that respect in Olshausen's and other clinics, I do not know whether they have been reported, however, they show that the liquor amnii never escapes completely.

I have tried the colpeurynter years ago in cases of prolapse of the cord and cephalic positions, where the os was not dilated. In one case I met with success, in other cases the umbilical cord became compressed between the colpeurynter and uterine wall, so I gave it up again. Manual reposition gives good results, if properly done, when the os is sufficiently dilated. After a large colpeurynter is expelled, the question is not whether the doctor will be able to do a version, but whether he will be able to extract the child. We know that many times, after expulsion of the largest colpeurynter, we are not able to extract a child whose head is caught in the cervix. I would never advise abdominal Cæsarean section in a case of prolapse of the cord when the uterine cavity has been in communication with the vagina. I do not think we are justified in risking the life of the mother by doing such an operation. I would rather push the head on the ileum and do vaginal Cæsarean section, and deliver the woman in that manner, especially if she is a primipara.

DR. STOWE (closing the discussion): The question was asked, "How much fluid is there in the uterine cavity?" Normally, we have about a pint; but it varies a great deal. We can inject a pint, and if there is no bad effect upon the pains, if they do not get tetanic, and less than three to four minutes apart, we can judge that we have about enough fluid. If any fluid leaks out, we can inject more through the uterine tube, so that leaking does not have any evil effect on the technique.

As to the length of the cord, it is only a minor point, because a large number of cords of normal length, and even short cords, can prolapse. It does not depend upon the length of the cord. A most favorable case for the use of this bag is: Where the diagnosis has been made early; where the cord has prolapsed but very little; where it has not been lying in the vagina for any length of time; where the condition of the child is good; where there has been no marked retraction of the uterine fibers around the fetal body; and where the os has been partially dilated. If the uterine wall has been retracted about the body of the fetus for any length of time, then the child is either dead or dying. Where a child is dying, there is no indication for this method of treatment.

As to the difficulty of extracting the fetus after the larger-sized bag has been expelled, I would say that this bag is larger than the largest-sized Voorhees bag. It has a basal diameter of eleven centimeters, and when that bag comes through the cervix, the cervix is dilated. If it is very rigid, we can complete the dilatation of the cervix by the hand. If it is soft, however, and the bag pulls through, I do not think we would have much trouble in extracting the after-coming head.

As to the justo-minor pelvis, I made this statement: Where you can replace the cord, and bring the head down, well-flexed, into the pelvic inlet, you have an ideal condition for the prevention of a recurrence of the prolapse. If you cannot replace the cord, and the cord lies compressed between the inlet and the head, the child will, in all probability, be dead. But where you have replaced the cord and the head fits the inlet closely, then the cord cannot fall down again, and labor goes on, and you have a spontaneous delivery and a live baby, so far as any danger or prolapse is concerned. I believe that as long as the integrity of the ovum is lost, the action of the uterine pains tends to force the cord and the fetus toward the cervix. One of the great difficulties after reposition of the cord is, and there is no liquor amnii in the uterus and an exit exists between the head and the wall of the uterus, every pain tends to force the cord through that exit. If we have a flat pelvis in a multipara, and the uterine walls are relaxed, any uterine pain will force the cord down to the largest diameter of the head, and possibly a strong pain, stronger than the rest, would force the cord through. This will not happen if we have the cavity of the uterus filled with the fluid; and although we have not as strong a wall at the cervix as we have at the fundus, as long as the bag lies in the cervix, and as long as the fluid is prevented from escaping from the uterine cavity, the difference is not very great. As long as

the integrity of the ovum is preserved, then the effects of the uterine pains have no tendency to force the cord from the cervix. After reposition of the cord the injection of the fluid tends to keep the cord where it is; that is, over the abdomen of the child, where there is no pressure or, at least, very little. But where there is no liquor amnii, it is immediately forced down between the head and lower uterine segment. If we are not able to force the cord behind and above the largest diameter of the head, then, of course, this instrument may not be used. I believe, theoretically, where we are not able to force the cord behind and above the largest diameter of the fetal head, in a multipara, where the uterine walls are relaxed, where the bag has been inserted and the cavity of the uterus filled with fluid, we can simulate the same condition that occurs with the fore-lying cord. Where the cervix is known to be partially dilated, and this bag has been placed above the cervix, the presence of the bag will tend to hold the fetal head away from the inlet, so as to prevent any pressure on the cord between the head and the inlet. It is always well to have the patient in the Trendelenburg position for possibly two or three hours. It is always undesirable to change the bag. We should, however, aim to put in the larger bag if possible; if we cannot do that, we can either put the patient over the back of an inverted chair and dilate the os manually until we can introduce a larger bag, or we can put in a smaller bag. The patient is chloroformed; we have relaxation of the uterine wall, and the fetal head falls back; then after the bag has been introduced the chloroform is withdrawn, the pains come on again, but the patient may be kept in the inverted posture still. As soon as we find the bag is being forced out by the dilatation of the cervix, we can give more chloroform, then take out the bag, and immediately put in the other bag without in any way causing a recurrence of the prolapse. The patient may be kept in the inverted posture throughout the entire period of treatment; and then all preparations for version having been made, we can do the version and extraction as soon as the os becomes dilated.

Dr. Joseph B. De Lee read a paper on Induction of Labor. (See paper.)

Dr. Rudolph W. Holmes: We all agree with Dr. De Lee's indications in so far as they apply to the induction of labor for special conditions. I must say, however, that I am at a loss as to when full time is reached. Generally, it is just those women concerning whom definite data is lacking who often have indications for inducing labor at a definite period. I have had a number of women who have known the date of the fruitful coitus, but who have gone two weeks over supposed term. I have ascribed it to the fact that there was delayed impregnation, as Dührssen has shown that spermatozoa can live for three weeks in the tubes after insemination.

As to menstruation, Dr. De Lee had a case where a young woman had married and thirteen months thereafter gave birth to her baby: she did not menstruate after her marriage. No one, I am sure, would maintian she had a pregnancy lasting thirteen months. Two years ago I had a patient who went two months over the expected time of delivery: I never considered she actually had an eleven months' pregnancy, but rather that she had erred in her data.

As to fetal movements, I do not think this evidence is worth overmuch, because the date of first experiencing fetal movements is dependent upon so many factors independent of the actual duration of the pregnancy. Again, I have had several women who never had lightening, because the head was pushed into the pelvis deeply by the fifth month: on the other hand, I have had a number of primiparæ who did not have any lightening. While all these various points may be of value in determining when full term is, we may have any one or all of them and still be away off as to the actual estimation of the certain date of labor at full term.

Dr. Charles E. Paddock: I think we must agree with Dr. De Lee that labor should be terminated in the class of cases which he described; not allowed to go overtime, because of complications which might and usually do arise, such as overgrowth of the child, with a difficult labor following, and frequently the death of that child, saying nothing about the traumatism which comes to the mother because of it. There should, however, be no guesswork concerning the probable time. An obstetrician, who has seen the case early in pregnancy and made a probable diagnosis as to the termination of it, and then watches the case in all its various phases during this pregnancy, is competent to say when that woman has arrived at the termination of pregnancy, and also whether the child is better out of the uterus than in. This practice of emptying the uterus at the end of term has been a rule of mine for several years wherever I could carry it out to my satisfaction; that is, wherever I could do so with the full consent of the patients and those interested, and could convince them of the importance of so doing. As a routine practice, this method, I confess, cannot be carried out; but where it can be, I am satisfied it is for the best interests of all concerned. In the induction of labor, I have not had the success in packing which Dr. De

Lee claims that he has had. While the packing is the first procedure, I generally have to resort to the introduction of the bougie to stimulate the uterus to action. I would ask the Doctor in what percentage of cases packing of the cervix and vagina is all that is necessary.

DR. CHARLES B. REED: This is an important paper because it is in line with the development of modern obstetrics. It is not, however, a paper that can be generally utilized. The determination of term, which is the most important one in the use of this method, has been discussed, but I think another objection that might be raised to it is that possibly it may degenerate into one of convenience for the physician. I know one phycisian, who, some years ago, was in the habit of making a tour of his expected confinement cases before his vacation came on, and of rupturing the bag of waters in certain ones so as to be sure that labor would come on, and delivery be effected, before he left town. Such reprehensible conduct as that should not be permitted. We cannot assume for a moment that the convenience of the physician should be consulted in such cases; yet it is susceptible of that interpretation, and may be so abused when it has such authoritative backing. Who can say that there are not cases which will require this absolute decision, and who is to decide when the physician in attendance makes the decision to which the untrained family can only agree?

I agree thoroughly with the indications which Dr. De Lee has laid down; but is it not possible that in normal pregnancies, where none of these conditions may be present, or can only be surmised as possibilities, that the same operation may be carried out for the convenience of the physician? Such an interference would be indefensible.

I think that the proposition, as developed by Dr. De Lee, will give rise to a storm of protest from the general obstetric world. It is certainly an advance over the rather pronounced views which Dr. Reynolds favored us with in December — the question of the delivery of a woman at term. And there is the point, of course, what is term? If we cannot come within forty days of it by computation — at any rate, legally — where is the decision to be met? We must regard the indications as Dr. De Lee gave them. He has mentioned false pains, which must be differentiated closely from the pains of pregnancy, that have been described by Schatz, which recur at the four and six weeks interval throughout pregnancy, but particularly toward the latter half of pregnancy. These pains are normal, are physiological, and are not to be confounded with the pains which are regarded as premonitions of labor.

The paper is an extremely interesting one, and marks a distinct change in obstetrical methods; but whether its teachings will be suitable for general use, I am very loth to say. I think the method will be restricted, as Dr. De Lee has said, to the most rigidly selected cases.

DR. JUNIUS C. HOAG: I have rarely induced labor, even when I felt the patient was at term. In this connection I wish to cite a case, in the presence of a gentleman who has discussed this paper, in which the patient was plainly in labor, although her pains were far from typical. She went on in this condition for probably ten days. She was a hospital patient; the os was much dilated. I instructed the intern to rupture the membranes; he did so, and the child was born in an hour and a half. When I cited the case to this gentleman, he said that such action would not be capable of justification in a court of justice. Now, it appears to me, he is weakening some in his indications, and I fear he may degenerate still further than the South Side practitioner, and get so that his engagement to a dinner-party or opera will not be interfered with. (Laughter.)

DR. HENRY F. LEWIS: I think we all agree that there are certain cases of prolonged labor which must be interfered with, as otherwise much harm may be done, in that both the mother and fetus run the risk of infection, especially after the membranes have ruptured. Furthermore, the child may become too large, if it is allowed to remain too long before delivery is effected. To say that we must deliver a woman, after we have estimated she has come to term, is, I think, going too far, because we do not know exactly when term is; at least, I do not know. Even with intelligent women, I am unable to find out exactly when they menstruated last. And certainly, I am seldom able to find out when the fruitful coitus occurred, not that my my patients cohabit less than others (laughter) but that is difficult to find out; and so far as making the determination of 280 days is concerned, I am absolutely at a loss, no matter how well I know my patients or trust to their intelligence. We can estimate the size of the child by the Ahlfeld method, measuring from the two poles to the os, as well as by the Perret method. I have investigated the latter and have practiced it a little and have found small use for it: I think other men who have pracicetd it in a large number of cases have given it up entirely. It is difficult for me also, through an abdomen of ordinary thickness, to be certain whether I am actually measuring an occipito-frontal or parieto-frontal diameter or something else. I find it difficult to be sure. Of course, one could use the

ordinary pelvimeter as well as the Perret instrument. The diameters of the child's head can only rarely be proven by this instrument to be as close as those in Dr. De Lee's cases.

DR. CHARLES B. REED: I would like to refer, again, to the question of operation as a means of preventing infection, or other dangers consequent upon labor. How would an operator justify himself in case infection should take place during his interference?

Another question might arise, which I would like to have the essayist discuss in this connection, and that is why he prefers a pack of gauze in the cervix in preference to the colpeurynter? I might say here, incidentally, in line with the remarks that have been made this evening, that I have a Carl Braun bag that I have used for three or four years, and it has been boiled so frequently that memory goeth not to the determination thereof, and I took it out the other day and blew it up, and it was still resistant and firm. I would like to have Dr. De Lee discuss the relative desirability of the two methods.

DR. DE LEE (closing the discussion): I do not wish it understood that my patients are more intelligent than those of Dr. Lewis and others, because we practice among the same kind of people, but I find by going carefully into the history of these patients and questioning them, they will almost always give me accurate dates as to the last menstruation, often of conception and quickening. In fact, most of the women keep a calendar and mark these on it. Cases, such as Dr. Holmes recited, where a woman does not menstruate from one child to another, where the puerperium passes into pregnancy, occur but rarely.

As to the time of lightening, I have never observed lightening as early as three or four months. Budin reports lightening at the sixth and seventh and eighth months, and the child went back into the abdomen and came down again. He shows pictures of babies in which the head was flattened from being in the pelvis a long time. As a matter of fact, lightening occurs two and a half weeks before the usual date of confinement. In but few places in medicine have we got absolute facts, but we make our diagnoses principally on a large number of probable conditions. The time of quickening is, in my experience, much more certain than Dr. Holmes would indicate from his experience. However, it also is subject to fluctuations. But these women watch themselves. They are anxious to feel the first fetal motion, and I put them on the alert. As soon as a woman engages me, and the majority engage me when they have missed one period, I put her on the alert, so that the time of quickening is noted on the calendar, and I get it at the next visit. All these data are revised by examinations during pregnancy. I examine and measure the pelvis externally, and nearly always internally; measure the baby by palpation; determine the size of the uterus, and the probable date of pregnancy. If that disagrees with the data the woman furnishes, I attempt to correct it. I see her several times, and make abdominal examinations before the advent of labor. I know well how the baby is growing, and I get a good notion of the advancement of pregnancy. When the time comes for labor to occur, according to computations, I send a nurse to the house and have the woman prepared. I make a careful examination, and if I find evidences of beginning labor, such as sensitiveness of the uterus, on manipulation, regular labor pains, beginning effacement and softening, with dilatation of the os, and all the earmarks of impending labor, I consider that woman is at term, and if she goes a week beyond that period I usually induce labor.

As to pregnancy at full term, I will say that children have been delivered as early as twenty-eight weeks. Parvin relates the case of a woman of royal blood who presented her husband at seven months with a full term child. Suspicion was aroused, trouble ensued, but reconciliation took place, when, seven months later, the mother was delivered of a full term baby. Twenty-eight weeks was sufficient for a full term child in her case. But those are exceptions.

I mentioned certain statistics. I took the last 75 cases of normal labor and figured out how close I came to my estimate as to the day of confinement, and I find that out of 75 cases, 33 came within 5 days of the time I computed, and 28 more within 8 days, making 61 out of 75 who came within 8 days of the time of computation of confinement, spontaneously, and the other 14 went not over 12 days. As a matter of fact the women who went over time had numerous complications, such as I mentioned in my paper.

We must make a distinction between prolonged labor and prolonged pregnancy. Women sometimes have prolonged labors. What are the signs of labor? Regular, recurring labor pains, which are felt and painful to the mother; effacement and dilatation of the cervix, with or without rupture of the bag of waters. If we find these symptoms, we would call them indicative of labor. We find them and yet delivery does not occur. I have seen them in some cases six weeks ahead of time. Prolonged labor does occur. I recall one instance in which a woman had pains for over six weeks; Dr. Taylor observed her, and subsequently sent

her to me. He had to give opium to induce sleep. Dr. Hoag's case parallels one I have had. The woman had false pains; she had uterine contractions and was in bed for two weeks. I found the cervix largely dilated; I punctured the membranes in the evening, and in two hours thereafter the baby and placenta were born. She was at full term.

Regarding measurements of the fetal head, Dr. Lewis does not believe much in the Perret cephalometer. In cases of hydramnion, and in those in which the fetal head has sunk low in the pelvis, we cannot do much with the cephalometer. But in the majority of cases you can measure the fetal head. I do not care whether I get this or that diameter; if I can get a diameter which shows a large head, I know the woman is at term, or at least that the child is large. Furthermore, I can get the diameter pretty nearly where I want it by a careful examination of the presentation. If it is a right occipito-posterior, I know in which diameter of the head the cephalometer will lie. If I get a cephalometric measurement of 11½ to 12 cm. that is a good-sized head in the grasp of the the instrument. By proving the measurements later I come within one-half of a centimeter of the diameter which I measured externally. That gives me a general notion, and is only used as a part of the diagnosis as to the size of the head of the child.

As to the methods of bringing on labor, I mentioned the gauze simply because that is the method I usually use. But I think I said, in addition to the recognized methods of inducing labor, I have instituted the use of gauze. If the doctor will pack five yards of that gauze in the lower uterine segment and cervix, and not pack the vagina, he will perhaps get better results than in laying the gauze in lightly. The gauze should be packed firmly into the lower uterine segment, in cases where the cervix is quite long and closed. This does not mean in the class of cases under discussion, because in these, the cervix is seldom closed, and when I find it closed I decide I have made a mistake in my judgment, and use that as an argument for postponing operation. In the cases where the cervix is long and closed, the indications for delivery are not so clear. I often put in a bougie, and use gauze in addition, and the bougie should curl up above the cervix; in these cases the gauze plus the bougie is very successful. The other methods which I use are seldom necessary. The colpeurynter and the puncturing of the bag of waters are seldom necessary. The case of the multipara I described is a parallel of Dr. Hoag's case. She had a large, soft cervix which I could have dilated with fingers, and delivered the baby, so that when I punctured the membranes I thought that was the simplest and quickest way. In a primipara I would not recommend that.

There is a method of bringing on labor at which some of you may smile, but success has followed its recommendation, and that is, suggestion. In cases of prolonged labor it is particularly useful. I have had one such case out of town. A woman, according to her reckoning, had gone three weeks overtime. With my computation of all facts she was just at term. She started in with labo pains in the evening, and at three o'clock in t morning the labor pains ceased; she fell aslee She awoke, dressed herself, and went about business. We waited a while, but I thought was at term. I diagnosed a large baby; the cer was big for a multipara. I telephoned in town a my colpeurynters in the presence of the patient. When she heard me telephone she says she turned cold from her feet to her head; pains came on at once. Five pains ruptured the bag of waters, and in an hour and a half the baby was born. The baby weighed ten pounds and one ounce. This was purely suggestion. It was intentional suggestion.

I have noticed in certain cases that where I have gone to a patient's house and examined her, shortly after labor has come on. Perhaps the manipulation had something to do with it. Perhaps putting the index finger in the cervix and the inevitable slight separation of the membranes might have had something to do with it.

As to justifying the operation, in case sepsis should occur,— if sepsis occurs, — there are two conclusions which may be drawn: First, the doctor introduced the sepsis. Second, he introduced into the uterus some infection that was in the vagina. Those are chances we have to take. I do not believe, however, infection will occur any more frequently from the induction of labor at term under the indications which I have given, than it will occur from the induction of labor for other cases, as placenta prævia. In cases of contracted pelvis, we all know about the mortality and morbidity from sepsis in induction of labor in general, in maternities, and with the use of rubber gloves — it is small. Personally, I have had no woman in my private practice who has become infected after this manipulation.

Views to accompany article by William J. Mayo, M. D., on "Acquired Diverticulitis of the Large Intestine." To prepare views for stereoscope, cut along black lines.

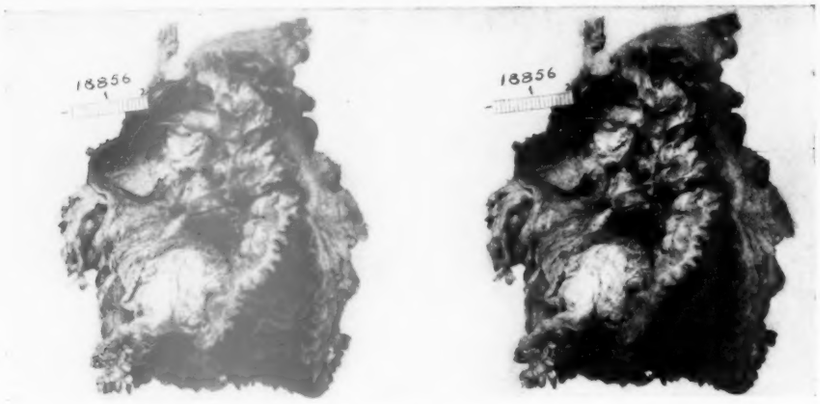


Fig. 5. Peridiverticulitis. Case 3. (18856.) x⅔ diam. Specimen shows pocketed mucosa, section of sigmoid wall with defective muscularis, and two diverticula — one having a pin thrust through it and the other with end removed showing enterolith. The inflammatory mass has been dissected from about the diverticula. A swollen gland is shown.

Fig. 3. Diverticulitis. Case 1. (H1903.) x3 dia shown in Fig. 1. Note muscularis in wall, occluded lum

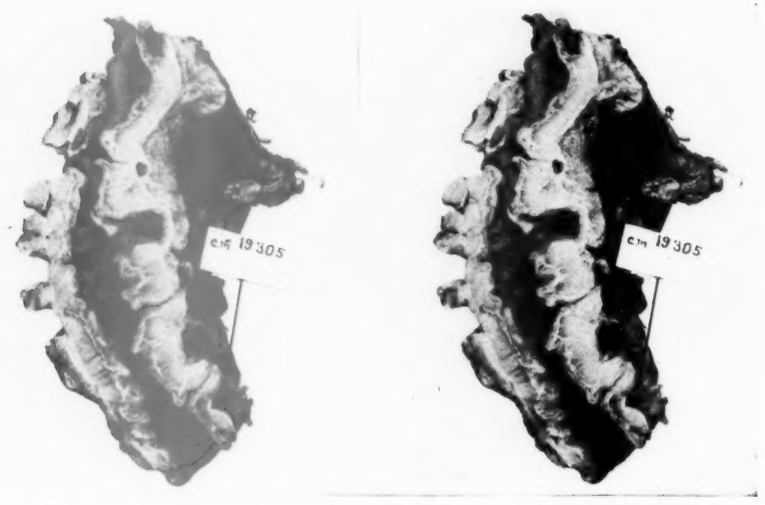
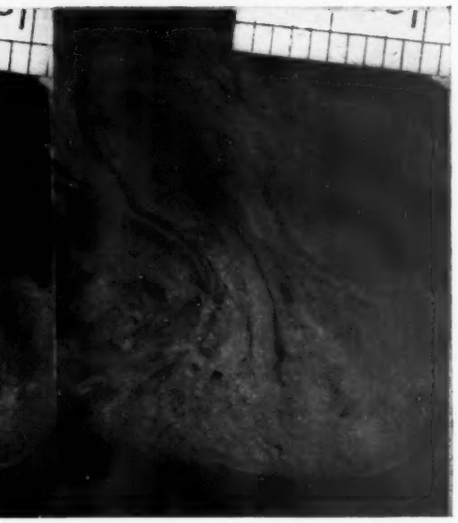


Fig. 6. Peridiverticulitis. Case 4. (19305.) x⅔ diam. Sigmoid divided longitudinally. Note defective musculature and the diverticula. Inflammatory mass dissected away near label needle.

Fig. 4. Peridiverticulitis. Case 2. (16736.) x⅔ d dissected away showing outer ends of numerous diverticul contain enteroliths.

Fig. 1. Diverticulitis. Case 1. (H1903.) x⅔ diam. Sigmoid laid open longitudinally. A diverticulum containing a sloughing ulcer is seen at the lower right hand; another is sectioned near the label needle.

Fig. 10. Peridiverticulitis. Case 5. (20202.) x sigmoid resected at second stage of operation.



03.) x3 diam. Enlarged view of sectioned diverticulum occluded lumen, and inflamed submucosa.

6736.) x⅔ diam. Inflammatory mass surrounding sigmoid ous diverticula protruding through the muscularis. Several

(20202.) x½ diam. External view of necrotic portion of on.

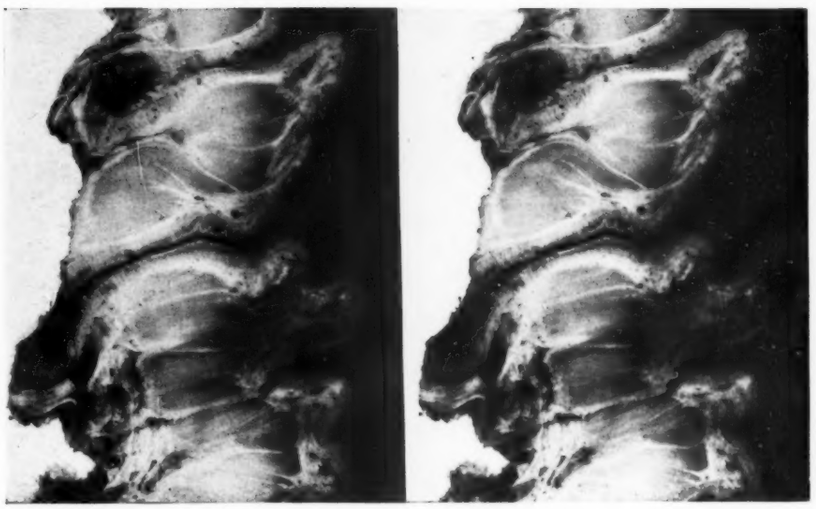
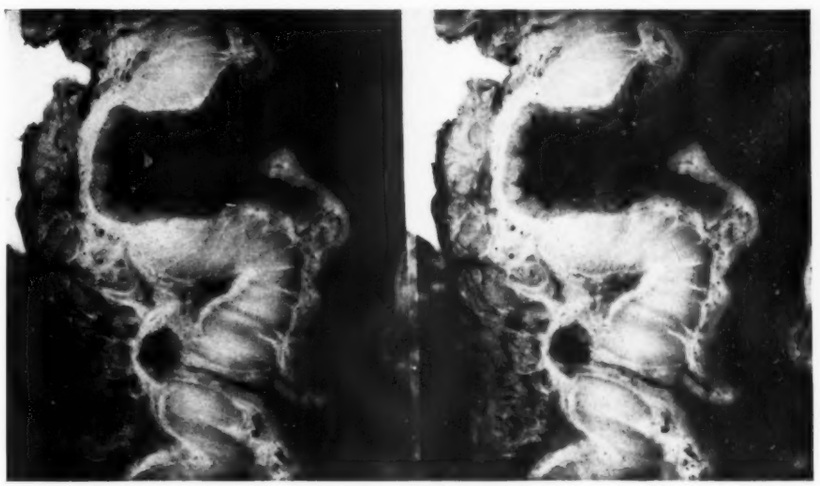


Fig. 8. Peridiverticulitis. Case 4. (19305) x3⅞ diam. Enlarged view of the diverticula, one of which is seen in Fig. 6, the other having been exposed by removing a thin section from the surface shown in Fig. 6. The inflammatory deposit in the subserosa has been dissected away.



Fi. 7. Peridiverticulitis. Case 4. (19395.) x2½ diam. Enlarged view of two diverticula, and one point of defective musculature seen in Fig. 6.

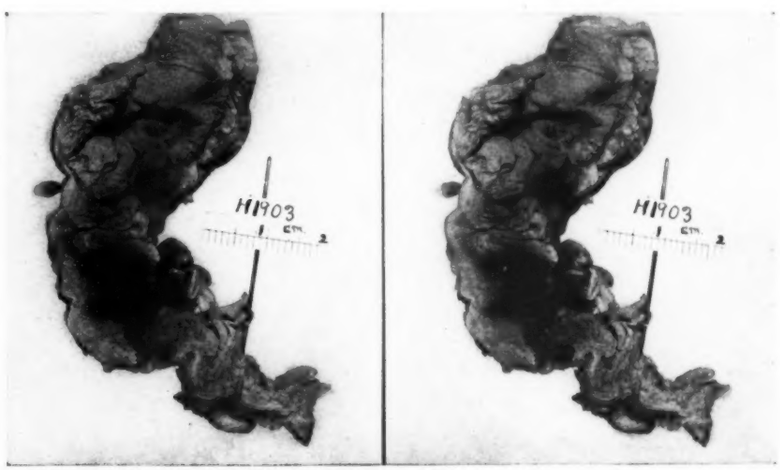


Fig. 2. Diverticulitis. Case 1. (H1903.) x1 diam. Section through ulcerated diverticulum shown in Fig. 1.

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